Animal bones and human society in the late younger stone age of arctic Norway

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Declaration

No material contained in this thesis has previously been submitted by me for a degree at this or any other university. If material has been generated through joint work, my independent contribution has been clearly indicated in the text. In all other cases, material from the work of others has been acknowledged and quotations and paraphrases suitably indicated.

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ABSTRACT

In recent decades anthropologists and archaeologists have divided hunter-gatherer groups into two types; "simple" and "complex". However, many documented foraging communities display traits associated with both types, and the placement of past and present hunter-gatherers into either category is problematic. The substantial house remains of the late Younger Stone Age hunter-gatherers of Varangerfjord, North Norway, have been connected by many archaeologists with sedentism and, by extension, with "complexity" and permanent social hierarchies. This analysis takes a more direct approach social organisation, using faunal remains to better define the social relationships between households within this community.

The large mammal remains from a series of houses are compared to determine whether all households had equal access to prey species and to different parts of large mammal carcasses. Towards this end, the climate and available resources are established for North Norway during the Younger Stone Age. Previous interpretations of the archaeology of the period, including the argument for "complexity" are then discussed. The study sites and associated faunal assemblages are presented. Seal hunting patterns are compared between households in terms of both the choice of species and the age breakdown of each hunted seal population. Local differences in the numbers of ringed seal are attributed to the preference of ringed seal for certain types of coastline. Strong similarities are noted between all sites in terms of both the season of seal hunting activity and the selection of adult versus juvenile harp seal and ringed seal. Distribution of seal and reindeer body parts are also compared between and within houses. Again, there are more similarities than differences between households. Seals were returned whole to all houses and reindeer body part representation appears to be mediated by the utility of each part for artefact manufacture. The implication of these results are discussed in terms of the structure of social relationships, symbolic behaviour and territoriality. The utility of this approach in a broader context is also considered.

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CHAPTER 1

INTRODUCTION: HUNTER-GATHERER ZOOARCHAEOLOGY AND THE QUESTION OF COMPLEXITY

1.1 Hunter-gatherer "complexity"

Since the 1980s, anthropologists have divided hunter-gatherers into two types; "simple" and "complex" (cf. Price & Brown 1985; Rowley-Conwy 1983). The simple type consists of small egalitarian groups of mobile hunter-gatherers. In contrast, complex hunter-gatherers have larger groups and are more sedentary, with inherited status and inequalities in both wealth and access to resources. The two types are often juxtaposed based on a series of attributes, including dependence on food storage and territoriality, both of which are much stronger in complex groups than in simple ones (Table 1.1; Keeley 1988). The terms "simple" and "complex" are potentially misleading. Although simple hunter-gatherers lack permanent social hierarchies, they possess complex organisational systems that regulate all aspects of life including the collection of food, social conduct, and access to territory. Kelly (1995: 294) prefers the terms "egalitarian" and "non-egalitarian".

Table 1.1 Simple versus complex hunter-gatherers (after Kelly 1995: 294, Table 8-1)

	Simple (Egalitarian)	Complex (Non-egalitarian)
Environment	Unpredictable or variable	Highly predictable or less variable
Diet	Terrestrial game	Marine or plant foods
Settlement size	Small	Large
Residential mobility	Medium to high	Low to none
Demography	Low population density relative to food resources	High population density relative to food resources
Food storage	Little to no dependence	Medium to high dependence
Social organisation	No corporate groups	Corporate descent groups (lineages)
Political organisation	Egalitarian	Hierarchical; classes based on wealth or descent
Occupational specialisation	Only for older persons	Common
Territoriality	Social-boundary defence	Perimeter defence
Warfare	Rare	Common
Slavery	Absent	Frequent
Ethnic competition	Not tolerated	Encouraged
Resource ownership	Diffuse	Tightly controlled
Exchange	Generalised reciprocity	Wealth objects, competitive feasts

Several archaeologists maintain that hunter-gatherer complexity can be demonstrated in the archaeological record (e.g. B. Olsen 1994: Chapter 4; O'Shea and Zvelebil 1984; Renouf 1989, 1991; Rowley-Conwy 1983). Once one or more traits attributed to non-egalitarian hunter-gatherers have been demonstrated, others are often inferred. A circular argument ensues; because one or more traits are displayed a group is complex, because it is complex other such traits must exist. For example, Renouf (1984, 1989, 1991) uses the representation of animal species on hunter-gatherer sites in North Norway to argue that the sites were occupied year-round. She then infers that because the groups were sedentary, they had high population densities and hierarchical social systems (see section 3.6.2 for a fuller discussion of Renouf's argument).

Such arguments are problematic since there are documented hunter-gatherer groups which defy the opposition between egalitarian and non-egalitarian societies, possessing characteristics of both. For example, the Inuit rely heavily on stored foods, but maintain an egalitarian social organisation (Layton 1986). Recently, a similar case has also been demonstrated in the archaeological record. Rowley-Conwy (1998) has suggested that the Ertebølle site of Skateholm I, on the south coast of Sweden, was occupied only seasonally during the winter months. This despite the fact that the size of the site indicates a large community and the associated cemetery suggests strong territoriality and potential status differences between individuals (ibid). There is a continuum of hunter-gatherer behaviours ranging between those traditionally defined as "simple" and "complex" (Keeley 1988). Rather than simply placing hunter-gatherer groups into either category, archaeologists should aim to define the organisational systems at work within each group.

1.2 The zooarchaeology of hunter-gatherers

The zooarchaeology of hunter-gatherers, both egalitarian and non-egalitarian, deals primarily with the formation of faunal assemblages by human and non-human processes and with diet-centred economic questions. Distinguishing the impact of humans on bone assemblages from that of carnivores and other natural processes has been a major focus in hunter-gatherer zooarchaeology over the past three decades (e.g. Brain 1981; Butler 1993; Hockett 1991; S. Olsen & Shipman 1988). Towards this aim, there have been a large number of actualistic studies of bone accumulation and alteration by human and

non-human agents (e.g. Andrews 1990; Bartram *et. al* 1991; Butler 1993; Marean & Spencer 1991; Mondini 1999). This emphasis on formation processes highlights the many causal agents affecting bone assemblages and shifts the emphasis of study away from all but the most basic hunter-gatherer behaviours.

An example of the dominance of economic approaches in hunter-gatherer zooarchaeology is the widespread use of utility indices. Since Binford (1978) developed the first food utility indices for sheep and caribou, many other such indices have followed (e.g. Diab 1998; Lyman *et al.* 1992; Metcalfe & Jones 1988; O'Connell *et al.* 1990; Outram & Rowley-Conwy 1998). These indices are plotted against archaeological assemblages in an attempt to establish the transport decisions involved in creating them (e.g. Landals 1990; Speth 1983). All assume that food value is the primary concern motivating carcass transport.

Recently, evolutionary ecology (also known as behavioural ecology) has had considerable influence on the study of hunter-gatherers (e.g. Kelly 1995; papers in Smith & Winterhalder 1992; papers in Winterhalder & Smith 1981). Evolutionary ecology explores the way in which natural selection and other evolutionary processes affect human behaviour. It assumes that human behaviour, as part of the human phenotype, is subject to natural selection. Individuals will therefore tend to behave in a way that maximises their own reproductive fitness or that of their social group (Kelly 1995: 50-51; Winterhalder 1999). Evolutionary ecology has been used to generate models of human behaviour in terms of resource selection, diet breadth, mobility, group size, exchange, territoriality and the development of inequality (Kelly 1995, Smith & Winterhalder 1992; Winterhalder & Smith 1981). However, only a limited number of these models are applied in hunter-gather zooarchaeology. Models of diet breadth, prey selection, and mobility in response to resource depletion have all been tested zooarchaeologically (e.g. Broughton 1994; Stiner 1994; Stiner *et al.* in press; Munro 1999). This has shed valuable light on the past interaction between human predators and their prey. However, as applied in zooarchaeology, the approach has so far provided little insight into hunter-gatherer social behaviour and organisation.

In contrast, among state level societies, zooarchaeological analysis is used to discuss a much broader range of human behaviour. Site formation processes and basic questions

of diet continue to be of interest, however social issues are also frequently addressed. For example, differences in terms of both species representation and body part representation have been used to argue for status differences across space and through time. To name only a few examples, status differences have been illustrated in this way on sites in Roman Britain (Stokes 1999), Medieval and Post-Medieval England (Driver 1990) and late nineteenth century California (Schulz & Gust 1983).

Christopher Hawkes (1954) proposed a ladder of inference, ranking different aspects of human activity in terms of the difficulty involved in inferring them directly from the archaeological record. At the bottom of this hierarchy are the techniques of production, which are "relatively easy" to infer (Hawkes 1954: 161). Next are subsistence-economics, also "fairly easy", followed by the social and political institutions governing communal organisation, which are "considerably harder" to infer (ibid). Finally, aspects of religious and spiritual life are "hardest of all" to deduce from physical remains in the archaeological record.

In archaeology generally, and in zooarchaeology in particular, there seems to be a second hierarchy in operation. Climbing Hawkes' ladder, as it were, appears to be an extremely daunting prospect in the field of hunter-gatherer studies. When dealing with hunter-gatherers, zooarchaeology undertakes fruitful inquiry into the spheres of techniques of production and subsistence-economy, but rarely ventures beyond. When dealing with state level societies, zooarchaeological data are also used to discuss social questions such as status differences. Thus, in terms of the goals of zooarchaeologists, Hawkes' ladder becomes more of a high jump. When faunal remains are used to answer questions about past human societies, the bar is set progressively higher as the focus of study shifts from hunter-gatherers to early agricultural groups to full blown state-level societies. Some might argue that this is because hunter-gatherer social systems are less formally structured than those of state level societies and therefore leave fewer clues in the archaeological record. This no doubt plays a role, but the difference also relates to the way in which zooarchaeologists working on hunter-gatherer material frame their questions. Currently, faunal assemblages produced by both egalitarian and non-egalitarian hunter-gatherers are approached almost exclusively in terms of subsistence economy. Zooarchaeological questions are not framed to address other aspects of hunter-gatherer behaviour. Perhaps it is time to raise the bar.

When dealing with questions of social organisation and status among state-level communities, a common approach is to compare the relative importance of species and the distribution of body parts between contexts. This approach has obvious potential to better define the nature of social interactions in cases where complexity has been suggested among archaeological hunter-gatherers. In fact, it has been used occasionally in clearly documented cases of hunter-gatherer complexity. One such example comes from the Hopewell complex in Mississippi. Large burial mounds suggest considerable status differences within this society. Jackson and Scott (1995) make a convincing argument for the provisioning of elite residences with the meatiest parts of deer carcasses. There is a second example from the Northwest Coast. At the site of Ozette in Washington State, the high status of one household was demonstrated through an analysis of the shellfish remains (Wessen 1994). This house demonstrated low absolute quantities and a limited diversity of shellfish relative to the other excavated houses, suggesting a lower reliance on what is ethnographically a low-value food in the region. Shells of *Dentalium pretiosum*, a species ethnographically associated with symbolic and ceremonial items were also far more common at this house than at any other. Despite the obvious potential of this approach, the analyses described above are the exception rather than the rule. This is surprising, given the number of excavations that have taken place in both regions in recent years.

1.3 A case study from arctic Norway

The comparative approach described in the examples above will be used in an attempt to define the social relationships between hunter-gatherer households in Arctic Norway. The faunal assemblages which will be studied come from a series of middens associated with house depressions on the coast of Varangerfjord, North Norway. The faunal remains from these sites indicate that hunting and fishing were the primary subsistence activities. All of the houses date within a few hundred years of each other and belong to period III of the Younger Stone Age, a time for which many archaeologists have argued a considerable level of cultural complexity (Myrvoll 1992; B. Olsen 1994; Renouf 1984, 1989, 1991; Schanche 1994). Both the limited geographical area and time period will help to reduce the possibility that spatial and temporal differences account for any potential variation. The houses are from six sites, and it is unlikely that all were occupied contemporaneously. This should not, however, interfere with the utility of the

approach. Among these households, special status can be expected to have manifested itself in similar ways. The marked similarities between the house structures in question (Schanche 1994) and their artefact inventories (ibid; Simonsen 1961) suggest the expression of a shared culture. Again, the limited geographical and temporal scale helps to ensure this.

In addition to the more traditional focus on subsistence, this analysis will attempt to identify variation both between and within households in terms of the relative importance of reindeer and various seal species. The representation of different body parts of these taxa will also be considered. Large mammalian taxa are the main focus of this investigation since the ethnographic record shows that this type of prey is highly valued among hunter-gatherers, and that hunting skill is generally associated with prestige (Kelly 1995: 267-268). These animals then, are the most likely to reflect status differences between households. Moreover, because they are large, they are more likely to be divided into smaller units and distributed within and between households (Blurton Jones 1984; K. Hawkes 1990; Marshall 1994), which makes them a potentially valuable tool in analysing social relationships, whether egalitarian or non-egalitarian. However, any variation observed cannot be immediately attributed to status differences between households. The issue of bone preservation must, of course, be considered, as must the potential influence of local environment and differences in terms of both season of occupation and site function.

Chapter 2 presents the climate and resources of Varangerfjord as they probably existed during the late Younger Stone Age. Chapter 3 goes on to summarise the history of archaeological excavation and interpretation in the region and discusses the arguments for "complexity". A presentation of the study sites and their faunal assemblages follows in Chapter 4. Chapter 5 examines the various processes which have influenced the preservation and recovery of the Varanger faunal assemblages. In Chapter 6, a detailed comparison is made of seal hunting techniques at each house in terms of the relative importance of seal species and the age breakdown of the hunted populations. Seasonality differences are ruled out as a possible explanation of inter-assemblage differences. Chapter 7 deals with the representation of different parts of the seal and reindeer skeleton between and within households. Both bone density and food utility are considered as potential explanations for the observed patterns before other alternatives

are considered. Finally, Chapter 8 returns to the original questions about social organisation, summarising the evidence and discussing its implications. Ritual and territorial behaviour were also suggested in the course of the analysis adding a further dimension to the interpretation of hunter-gatherer society during the late Younger Stone Age of Arctic Norway.

CHAPTER 2

THE ENVIRONMENTAL SETTING OF VARANGERFJORD

2.1 Location and character of the fjord

Varangerfjord is situated in the far north-east of Norway, close to the modern borders with Russia and Finland (Figure 2.1). The fjord is located in the modern county (*fylke*) of Finnmark, which together with the counties of Nordland and Troms comprises North Norway. The 70th parallel passes through the middle of the fjord for much of its length, placing it on similar latitude to central Greenland and the north coast of Alaska. Unusually wide at its mouth, the fjord opens eastward into the Barents Sea. Not far to the west and south, the Barents Sea meets the Norwegian Sea.

Varangerfjord itself has a length of approximately 100 km, and comprises roughly 500 km of coastline. Numerous rivers and streams empty into the fjord, the largest among them the Pasvik River and the Neiden River, both on the south shore (Figure 2.2). The entire Scandinavian peninsula was heavily glaciated during the last ice age, with an ice thickness of up to 3000 m at the centre of the ice sheets (Rudberg 1987). The ice load caused a depression of several hundred metres in the Earth's crust. Towards the end of the glacial, the land began to rebound as the weight of the ice diminished, and sea level began to rise due to the influx of glacial melt-water. In north-eastern Norway, the land rose faster than the sea resulting in a net decrease in sea level, a process which continued well into the post-glacial period. Evidence of isostatic uplift, the rebound of the landmass, is highly visible around Varangerfjord in the form of raised beach terraces. Many of the archaeological sites in the region occur on these terraces, which would have been close to the active beach at the time the sites were occupied. Older sites (and older terraces) are located higher above the present sea level than more recent ones. Towards the end of the Younger Stone age, the sea level in Varangerfjord was roughly 11-13 m higher than at present (Fletcher *et al.* 1993; Møller 1987). Figure 2.3 illustrates the present shoreline of Varanger compared to that postulated for 4500 BP.

The coastline on the north side of the fjord has a very different character than that on the south. Varangerfjord is a product of faulting rather than the glacial activity generally

responsible for creating fjords, so its two sides have completely different geological compositions. The north side consists of Eocambrian sedimentary rock, such as sandstone and slate, while the south side is made up of Precambrian gneiss and granite (Rudberg 1968). The northern shore has a fairly straight coastline, unbroken by inlets. It often slopes gently inland, though in some places there are steep cliffs of irregular height. In contrast, the coastline of the south shore is highly complex, with many coves and bays, and a series of large inlets or sub-fjords situated near the fjord mouth in the east. The differing character of the two sides of the fjord would have been accentuated by a higher relative sea level. South shore inlets were larger, and several promontories were cut off from the mainland, creating more islands off the south coast (Figure 2.3).

2.2 The surrounding seas

Varangerfjord opens into the Barents Sea (Figure 2.1), a shallow shelf sea with depths generally ranging between 100 and 400 m (Blindheim 1987: 20; Mosby 1968: 20). The neighbouring Norwegian Sea, which bounds the west coast of Norway, is considerably deeper, with an average depth of 1600 m and a maximum depth of over 5000 m (Blindheim 1987: 20). From the Norwegian shore out to the edge of the continental shelf, however, it is only a few hundred metres deep (Sætersdal 1960: 191).

The productivity of an ocean ecosystem is largely determined by the growth conditions for phytoplankton. These microscopic plants form the basis of all marine food chains. The nutrients upon which phytoplankton thrive, including phosphorous, nitrogen and silicon, are produced on the ocean floor through the decomposition of dead organisms and are found in high concentrations in the bottom water of all seas (Blindheim 1987: 30). Surface waters are relatively poor in nutrients, and large blooms of plankton will not occur unless the nutrient-rich deep waters are brought to the surface. There is a large degree of vertical convection in the Barents Sea, due to the cooling of the surface waters during the winter months (Sætersdal 1960: 192). Because the Barents Sea is shallow, this winter convection reaches to its bottom, resulting in a high concentration of nutrients at the surface (Blindheim 1987: 30), and ensuring high levels of primary productivity. The Norwegian Sea is also highly productive because of deep convection in the adjacent Greenland Sea (Blindheim 1987: 30).

The most important ocean current for Varanger and Norway's west coast is the Norwegian Atlantic Current, an offshoot of the Gulf Stream (Figure 2.4). From the Faero-Shetland channel, it flows up the Norwegian coast along the edge of the continental shelf. At about 72°N it splits, with one branch flowing north along the west coast of Svalbard, and another turning east into the Barents Sea where it passes Varangerfjord. This current originates in the Gulf of Mexico and brings warm Atlantic water to the northern latitudes of Norway. The Atlantic water just outside the mouth of Varangerfjord had a recorded average temperature of 6°C and a salinity of 34.5‰ at a depth of 100 m in August 1980 (Blindheim 1987: 22). This water lies below a warmer, less saline surface layer in summer, but during winter, stratification between the two layers breaks down and mixing occurs, bringing the Atlantic water to the surface. Its warmth and salinity mean that there are ice-free harbours along the entire length of the Norwegian coast. Ice formation in the fjords depends largely on the salinity of the surface water as cooling sets in (Mosby 1968: 28), and the amount of ice cover in these areas is thus a very localised phenomenon. In Varangerfjord, the inner fjord and the sub-fjords of south Varanger freeze annually.

2.3 Modern climate

Because of the ameliorating affect of the Norwegian Atlantic Current, the climate of North Norway is much milder than its extreme northerly latitude would suggest. This warming affect, however, disappears rapidly further inland and at increased elevation. It is also less noticeable in the far north than it is further south. The coast of North Norway is particularly stormy during the winter, as the warm air above the Norwegian Atlantic Current meets with colder arctic air associated with the East Greenland Current, creating cyclones of varying strength (Hansen 1960: 39-40).

The north side of Varangerfjord has a more maritime climate than the south side, which is more protected from the open sea. Winter temperatures on the north shore average 4 to 5°C warmer and summer temperatures 3 to 4°C cooler than on the south side of the fjord, while temperatures in the inner fjord area are intermediate between the two (Nordseth 1987: 122-123). At Vardø, on the north side of the fjord at the outer coast, the average January temperature is -4.8°C while the average July temperature is +8.9°C. At Kirkenes, on the south shore, the average temperatures for those months are -9.3°C

and +12.3°C respectively (Hansen 1960: 47). Throughout the fjord, the prevailing winds are from the south-west in winter and the north in summer (Naval Intelligence Division 1942: 97-99)

Varangerfjord is one of the driest regions on the Norwegian coast. Annual precipitation ranges between 400 and 600 mm on the north side of the fjord, and is less than 400 mm on the south side and in the inner fjord (N.I.D. 1942). Most of the precipitation falls in the late autumn and winter as snow, while the spring is relatively dry (Hansen 1960: 46). Snow covers the ground for over 6 months of the year, generally arriving in late October or early November, and disappearing in mid-May (Wallen 1968: 57). The vegetative season, that period of the year where the average daily temperature reaches 6°C, is roughly 110 days (slightly shorter at the extreme outer coast, slightly longer in the inner fjord) from June to September (Hansen 1960: 47; Nordseth 1987: 124).

The only strongly Arctic feature of the Varangerfjord climate is the amount of daylight, which shifts between extremes of light and dark throughout the year. At 70°N, the sun does not drop below the horizon for 73 days in the summer (May 16-July 26), and if twilight is included, the number of light nights increases to 127 (N.I.D. 1942: 114). There is a corresponding dark period during the winter, when the sun does not rise for 62 days (November 21-January 21). However, barring thick cloud cover, there are several hours of twilight every 24 hours during this dark period, down to a minimum of just over 4 hours of twilight on the winter solstice (N.I.D. 1942: 350).

2.4 Modern vegetation

The vegetation of North Norway can be roughly divided into three zones, Arctic, Subarctic and Boreal (Figure 2.5). Differentiation occurs within these regions due to changes in elevation, and the vertical plant zones are known as the alpine and subalpine belts. The plant communities of the alpine belt are located above the treeline in mountainous terrain, and are virtually identical to those of the Arctic zone (Hustich 1968: 66). The subalpine belt, which occurs at moderate elevations directly below the treeline, has essentially the same vegetative composition as the Subarctic zone (ibid).

The Arctic vegetation zone, which lies beyond the polar tree limit, makes up only a small band along the outer coast of the extreme north of Norway. Low, hardy dwarf shrubs, particularly heath plants (*Ericaceae*) such as heathers and low-lying berries, characterise this region. Permafrost, which plays a large role in determining the Arctic plant cover in Canada and Eurasia, has a very limited distribution in northern Norway (Hustich 1968: 64).

The Subarctic zone, which includes most of Varangerfjord, lies immediately south of the Arctic zone and is separated from it by the treeline. While the treeline elsewhere in the globe is formed by coniferous species, in North Norway it is made up of hardy mountain birch (*Betula pubescens tortuosa*). This low-growing birch characterises Norwegian Subarctic vegetation, becoming shrub-like towards the treeline (Sjörs 1987). The southern border of the Subarctic zone is formed by the northern limit of continuous Scots pine (*Pinus sylvestris*) forest. There are, however, stands of pine and isolated pine trees within the Subarctic region on well-drained sites with favourable exposure (Hustich 1968: 62-65). Occasional Norway spruce (*Picea abies*) are also found (Sjörs 1987: 141). Deciduous trees other than birch are rare, except for several species of shrub willow (*Salix*) which are common in the many wet areas.

Heath plants thrive in this region, among them Labrador tea (*Ledum palustre*), northern bilberry (*Vaccinium uliginosum*), cranberry (*Vaccinium oxycoccos*), bearberry (*Arctostophylos uva-ursi* and *A. alpina*) and cowberry (*Vaccinium vitis-idaea*), also known as lingonberry or whortleberry. With the exception of Labrador tea, all of these plants produce edible berries. The bog species cloudberry (*Rubus chamaemorus*) is also abundant and produces edible berries which are today an important cash crop.

The Boreal zone, or *taiga*, is an extension of the coniferous forest which covers Eurasia and North America. The region consists mainly of Scots pine and Norway spruce, though the latter does not extend quite as far north as Scots pine (Sjörs 1987: 134). Along with the two dominant conifers, several deciduous trees including rowan (*Sorbus aucuparia*), aspen (*Populus tremula*), birch (*Betula pubescens* and *B. verrucosa*) and grey alder (*Alnus incana*) also grow in the region. Low-lying plants include bilberry (*Vaccinium myrtillus*), cowberry (*Vaccinium vitis-idaea*) and twinflower (*Linnaea borealis*) (Sjörs 1987: 140).

2.5 Climate and vegetation change in Varanger

The late Younger Stone Age falls within the Subboreal period (5000-2500 BP), marked by milder temperatures and less precipitation than the previous Atlantic period (8000-5000 BP) and the current Subatlantic period (2500 BP-present) (Mangerud *et al.* 1974). Average temperatures during the Subboreal were slightly warmer than today (ibid), however recent research has shown that there were short-term climatic fluctuations throughout the period (O'Brien *et al.* 1995). Fletcher *et al.* (1994) have linked beach formation in North Norway to the stormy seas associated with colder winters. They documented extensive beach formation at the outer coast of the Varanger peninsula in the period around 3700±200 BP, which indicates that the Varanger region may have witnessed a period of cooler winters during the last centuries of the Younger Stone Age.

The coast of Varangerfjord was far more heavily wooded during the Subboreal than at present. Pollen cores from the region suggest that first birch and later pine invaded the area following deglaciation. The birch woodland reached its maximum extent between 9000-8500 BP (Hyvärinen 1976) while pine did not reach the maximum extent of its range until roughly 7500 BP (Hyvärinen 1975). Both pine and birch began to retreat around 5000 BP as the Subboreal climate was established, but the modern vegetation pattern (Figure 2.6) was not fully developed until 3000 BP (Donner *et al.* 1977; Hyvärinen 1975, 1976; Prentice 1981). The retreat of the mixed pine and birch forest had already begun at the time when the Gressbakken-type houses were in use around Varangerfjord. However, both species probably still grew in the area, as evidenced by the identification of large amounts of birch and some pine in the charcoal samples from archaeological sites of the period (Schanche 1994: 96-98). At this time, birch, and to a lesser degree pine, dominate the pollen profiles from a series of cores in the region, suggesting a birch forest (perhaps discontinuous) with stands of pine (Hyvärinen 1975; Prentice 1981).

2.6 Fauna

The Younger Stone Age occupants of the Varanger region would have had a substantial number of faunal resources at there disposal. Marine resources in the form of fish, sea

birds and sea mammals would have been particularly abundant, given the high productivity of the Barents and Norwegian Seas.

2.6.1 Sea mammals

Before the advent of modern commercial fishing practices, the productive waters of the Barents Sea would have been home to massive populations of fish, which would in turn have supported a much larger sea mammal population than that currently found in the area. Varangerfjord provides a seasonal home for two migratory species of seal, harp seal (*Phoca groenlandica*) and ringed seal (*Phoca hispida*), as well as smaller numbers of harbour seal (*Phoca vitulina*), grey seal (*Halichoerus grypus*) and bearded seal (*Erignathus barbatus*), which are found in the area throughout the year. A more detailed description of the habits of each of these species is presented in Chapter 6 along with a discussion of their exploitation during the late Younger Stone Age. The only other Pinniped which may have frequented Varangerfjord is the walrus (*Odobenus rosmarus*). Today walrus are largely restricted to the coastal areas of the Arctic Ocean and adjoining seas where they inhabit the moving pack ice. Historical accounts, however, indicate that they used to be found regularly along the North Norwegian coast (Nowak 1991).

A large number of whale species are found in the waters of the Bering Sea either seasonally or year-round. They include beluga (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), sperm whale (*Physeter catodon*), killer whale (*Orcinus orca*), grey whale (*Eschrichtius robustus*), minke whale (*Balenoptera acutorostrata*), sei whale (*Balenoptera borealis*), fin whale (*Balenoptera physalis*), blue whale (*balenoptera musculus*), right whale (*Eubalaena glacialis*) and bowhead whale (*Balaena mysticetus*). All of these species are found close to shore at least seasonally, except for the sei whale, which is a deep water species (Nowak 1991). Records from the seventeenth century indicate that January and February were the most important months for whaling in Varangerfjord (Odner 1992: 25). Large numbers of whales entered the fjord following schools of capelin. Groups of these animals often became stranded on mudbanks and in areas of shallow water where they were killed by the local Saami (ibid).

Three other species of sea mammal are important in the Varanger fauna; harbour or common porpoise (*Phocaena phocaena*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*) and white-nosed dolphin (*Lagenorhynchus albirostris*). The harbour porpoise is generally between 1.2 and 2 m long. It frequents coastal waters, bays, estuaries and occasionally ascends rivers during the summer months, while tending to move out to sea during the winter (Gaskin 1984; Gaskin *et al.* 1974). The Atlantic white-sided dolphin is a pelagic species common off the west coast of Norway, but also occurs less frequently in North Norway (Mitchell 1975). The white-nosed dolphin tends to have a more northerly distribution than the Atlantic white-sided dolphin, and is common in Varangerfjord primarily in the summer months, though it can be found year-round (Collett 1912: 684). White-nosed dolphins occur in groups of up to 1500 when they are feeding on migrating shoals of fish, but are generally found in much smaller groups of around six (Mitchell 1975). An adult male weighs roughly 250 kg, and an average female roughly 235 kg (ibid).

2.6.2 Land mammals

A much more diverse range of land mammals occupied Varanger 2000 years ago than at present. Certain forest-dwelling mammals, which do not presently range as far north as Varanger, may have been found in the area at the time. The most notable of these is elk (*Alces alces*), which today extends only as far as Porsanger (Christiansen 1960: 74), roughly 150 km south-west of Varangerfjord. More importantly, several mammalian species which occupied the area during the Younger Stone Age are today extinct due to over-hunting by humans. These include brown bear (*Ursus arctos*), also known as grizzly bear, grey wolf (*Canis lupus*), lynx (*Felis lynx*) and European beaver (*Castor fiber*).

Small mammals found in the Varanger region are mountain hare (*Lepus timidus*), lemming (*Lemmus lemmus*), and a number of small carnivores including ermine (*Mustela erminaea*), marten (*Martes martes*) and European river otter (*Lutra lutra*). The river otter is found both at the coast and in the interior lakes and rivers (Nowak 1991: 1135). All of these small carnivores may have been valued for their fur. Another important fur-bearing animal found in the region until this century is the European beaver (*Castor fiber*). Beavers feed largely on tree bark and young shoots of willow and birch (Nowak

1991), and were probably quite common during the late Younger Stone Age given the more extensive tree cover.

A number of large carnivores are (or were until this century) resident in north-east Finnmark. These include three canids: red fox (*Vulpes vulpes*), grey wolf (*Canis lupus*), and domestic dog (*Canis familiaris*). The latter occurs world-wide in association with human settlements. Based on their size, H. Olsen (n.d.) identified some of the canid bones from the late Younger Stone Age deposits in Varanger as domestic dog. Now hunted to extinction in the region, wolverine (*Gulo gulo*), lynx (*Felis lynx*) and brown bear (*Ursus arctos*) would all have been part of the local fauna. There are depictions of bear hunting in the rock art at Hjemmeluft, near Alta, dating to roughly 4200-3600 BC (K. Helskog 1988). One of these images shows bears being hunted shortly after emerging from their winter den (Figure 2.7). Naturally, the question remains whether this illustrates real or mythical events (ibid), but the brown bear bones and teeth identified at several of the Varangerfjord sites provide less ambiguous evidence of bear hunting.

Two artiodactyl species, elk (*Alces alces*) and reindeer (*Rangifer tarandus*) would have occupied the Varanger region two thousand years ago. Elk prefer wooded habitat with seasonal snow cover (Franzmann 1981). Today, they do not range as far north as Varanger, but they probably did so during the more heavily forested early Subboreal, before the mixed pine and birch forest retreated to its present extent. Indeed, the studied assemblages contain three elk bones and a single fragment of positively identified elk antler (see Chapter 4). This suggests that elk were present in Varanger two thousand years ago, but perhaps only in small numbers at the outer extremes of their range.

Reindeer are today found in Varanger only as part of the tame herds of the Saami people. Wild reindeer, however, occupied the area until the late seventeenth or early eighteenth century (Vorren 1975). "Reindeer" is the common name used to refer to the old world distribution of the circumpolar species *Rangifer tarandus*, known in the new world as "caribou". There are limited morphological differences between reindeer and caribou, with a much more pronounced distinction in both regions between forest and tundra forms (Banfield 1961). The woodland sub-species lives mainly in the boreal forest. Individuals are larger, less gregarious and more wary than tundra animals, and

undertake relatively short migrations (Burch 1972; Paine 1988; Spiess 1979). The tundra sub-species migrates long distances between its summer range in the open environments of the arctic and subarctic vegetation zones, and its winter range in the boreal forest.

Reindeer/caribou provide an important source of meat and raw materials among the many historically documented cultures which exploit them. Reindeer body fat varies considerably throughout the year, with males and females in prime condition at different times. Reindeer have marked sexual dimorphism, with an average male weighing 110 kg, and an average female 81 kg (Banfield 1974). In both males and females, the major fat deposits are along the back from the neck to the base of the tail, and around the internal organs. Males have their highest levels of body fat immediately before the rutting season in October, and lose almost all of this fat during the exertions of the rut. The highest fat content in females occurs in the spring, just before calving, and in the autumn before snow cover (Burch 1972). Ethnographic records from a series of cultures indicate that hunters tend to select for animals in prime condition, preferring bulls in the early autumn and females during and after the rut (ibid). Numerous uses for the inedible parts of the animal are also documented. These include using reindeer hides to make clothing, bedding and tents, using reindeer sinew to bind composite tools and lace snowshoes, and using reindeer bone and antler as a raw material in tool manufacture (Gubser 1965; Meldgaard 1983; Odner 1985; Paine 1994). Because of its extremely high density, antler is particularly valued in tool manufacture, and is sometimes used almost to the exclusion of bone (Grønnow *et al.* 1983: 35-36).

The gregarious and curious nature of reindeer makes them one of the easiest game animals to kill, and they can be hunted using bow and arrow, spear, snare, or pitfall trap (Burch 1972; Grønnow 1986). Reindeer are not generally wary and during their migrations are almost oblivious to danger from any animate source (Burch 1972). In summer, the sight and sound of people rarely frightens reindeer. In winter however, the animals disperse and are far more wary of humans, startling at the slightest sound (Burch 1972; Gubser 1965).

There is evidence around Varanger for the extensive exploitation of wild reindeer by the early Saami occupants of the region. The Saami are the indigenous peoples of northern

Norway, Sweden, Finland and north-western Russia. Today, those still leading a traditional lifestyle raise domestic reindeer for their own use and for sale. Historical records from the sixteenth and seventeenth centuries indicate that before reindeer pastoralism became the dominant way of life, the Saami depended heavily on wild reindeer hunting (Odner 1985; B. Olsen 1987). Reindeer were hunted mainly in the fall using extensive trapping systems (B. Olsen 1987). Vorren (1978) has mapped over four thousand pitfall traps grouped into twenty-five trapping systems in the Varanger peninsula and inner-fjord area, and B. Olsen (1987) has recorded over nine hundred pitfalls in the Luoftejokka valley, as well as five converging stone fences ending in circular enclosures. None of these traps are securely dated, and some might well date back to the Younger Stone Age (Ericka Engelstad, pers. comm. 1998). One of the Hjemmeluft rock carvings portrays a large group of reindeer within a fenced enclosure (Figure 2.7), perhaps indicating that reindeer traps were constructed as far back as 4200-3600 BC. Again, however, one cannot be certain whether the rock art images represent real or imagined events (Knut Helskog, pers. comm. 1998).

The location of the pitfalls and reindeer fences around Varanger closely corresponds with the modern migration pattern of the domestic reindeer, suggesting that the wild reindeer followed the same migration routes (Renouf 1989: 41). The most important of these routes is between the Varanger peninsula, north of Varangerfjord, where the animals graze during the summer, and their winter habitat in South Varanger south-west to the Tana River, and in the pine forest north of Lake Enare (Vorren 1951: 38) (Figure 2.8). This migration pattern is probably reflected in the high concentration of traps and fences in the area between Varangerbotn, at the head of Varangerfjord and the Tana River to the west (Renouf 1989: 41). Many Saami drove their reindeer herds through this region in the spring and autumn as they moved between the summer pasture to the north and the winter pasture to the south (Vorren 1975: 247). A less popular migration was between summer pasture around the sub-fjords of southern Varangerfjord, and winter feeding areas in the pine forests around the Pasvik River. In some locations east of the Pasvik River, there were areas of pasture used for both summer and winter grazing (Vorren 1951: 38).

2.6.3 Birds

The Varanger region provides a winter home for several bird species which breed in the high Arctic, a summer breeding ground for numerous species which winter in the south, and a permanent home for a number of other bird species. The most common winter birds are arctic island species including little auk (*Plautus alle*), Brunnich's guillemot (*Uria lomvia*), fulmar (*Fulmarus glacialis*) and king eider (*Somateria spectabilis*). On rare occasions, Brunnich's guillemot has been known to spend the summer in Finnmark (Collett 1921: 139) and the king eider may have previously nested on the Finnmark coast, though today its closest nesting grounds are on Svalbard (Collett 1921: 143). All of these winter visitors feed in large groups, both on land and out at sea within sight of shore (N.I.D. 1942: 132-134; Peterson *et al.* 1974).

During the summer months, large colonies of sea birds breed on the islands of Renøy and Hornøy near Vardø, on Ekkerøy and Lille Ekkerøy near Vadsø, and on the cliffs in the sub-fjords of south Varanger as well as on Kjelmøy (Christiansen 1960: 81, 1979). These colonies consist primarily of razorbills (*Alca torda*) and common guillemots (*Uria aalge*), both members of the auk family (*Alcidae*), and kittiwakes (*Rissa tridactyla*), a member of the gull family (*Laridae*). Puffins (*Fratercula arctica*) also nest in the region's cliffs, as do gannets (*Sula bassana*). Shags (*Phalacrocorax aristotelius*) and cormorants (*Phalacrocorax carbo*) breed on skerries and rocky ledges during the summer, and large numbers of them remain in Varanger through the winter (Peterson *et al.* 1974: 22; Renouf 1989: 27). The flightless great auk (*Alca impennis*), now extinct, is found in the archaeological material from Varanger, and probably also nested in the area as a summer migrant (H. Olsen 1967: 136).

Many other gulls breed around Varanger during the summer, occupying relatively flat, grassy holms known as *fuglevær*. These rookeries are used by great black-backed gulls (*Larus marinus*), common gulls (*Larus canus*), lesser black-backed gulls (*Larus fuscus*) and herring gulls (*Larus argentatus*). Glaucous gulls (*Larus hyperboreas*) are resident in the region year-round, as is a large portion of the herring gull population. Another year-round resident which nests in the rookeries is the common eider (*Somateria mollissima*), which is the most plentiful duck species in Varanger (Christiansen 1960: 81; H. Olsen 1967: 147). Eider down and eggs were an important economic resource well into the twentieth century (ibid).

Numerous species of ducks and geese breed on the lakes and heaths surrounding Varangerfjord. The goosander (*Mergus merganser*) breeds in May and June at scattered locations throughout Varanger, particularly in the areas of birch forest to the south of the fjord, while long-tailed duck (*Clangula hyemalis*) and red-breasted merganser (*Mergus serrator*) are present year-round (Vaughan 1979). The latter two species nest on land during the summer and spend the winter at sea. Long-tailed ducks are abundant, and are second in number only to the common eider (Blair 1936: 52; Schånning 1907: 83). Whooper swan (*Cygnus cygnus*) is particularly numerous during its spring and autumn migrations to and from its nesting grounds in the interior of Finnmark (Schånning 1907: 67). Various shore birds (*Scolopacidae*) are migrants to the region, and the white-tailed eagle (*Haliaeetus albicilla*), also known as the European sea eagle, is a permanent resident.

Several bird species not associated with the sea are also found in Varanger. Ravens (*Corvus corax*), hooded crows (*Corvus corone cornix*) and several northern species of finch (*Fringillidae*) are all present throughout the year. In addition, two important game birds are resident in the region; willow or red grouse (*Lagopus lagopus*) and capercaillie (*Tetrao urogallus*). Both spend the summer months at higher elevation, returning to over-winter in the lowlands around the fjord (Peterson *et al.* 1974). The capercaillie prefers coniferous hilly woodlands, and south Varanger is today at the northernmost extent of its range (ibid: 104, H. Olsen 1967: 152). It would have been more numerous in the area during the late Younger Stone Age since the pine forest extended farther north at that time. The ptarmigan (*Lagopus mutus*), which prefers high mountain elevations, is seen only rarely in the Varanger region, where it tends to be restricted to the mountainous areas at the outer coast (Schånning 1907: 57).

2.6.4 Fish

Almost seventy species of fish are found off the coast of Norway (Sund 1968: 251), but the majority of these are restricted to the more southerly regions. The highly productive waters off the north coast of Norway, however, mean that limited species diversity is compensated for by large population size. There are extremely large numbers of both pelagic fish, which occupy the shallower inshore waters of the continental shelf, and deep water demersal fish. The most numerous pelagic species are cod (*Gadus morhua*), saithe

(*Pollachius virens*), haddock (*Melanogrammus aeglefinus*) and herring (*Clupea harengus*) (Christiansen 1960: 95). In Nesseby, at the head of Varangerfjord, the traditional fishery included, in order of dietary importance, cod, haddock, saithe, cusk (*Brosme brosme*), wolffish (*Anarhichas lupus*), plaice (*Pleuronectes platessa*), and salmon (*Salmo salar*) (Helland 1906: 427).

The Barents Sea population of cod fish (*Gadus morhua*) migrate up and down the north Norwegian coast in order to reach their spawning grounds off the Lofoten islands. These cod hatch in North Norwegian waters between February and April, and in their first year of life are carried northward by the Norwegian Atlantic Current into the Barents Sea. These young cod reach Finnmark by March or April and remain until June, feeding on the large shoals of capelin which spawn very close to shore and on the beaches in spring (Sætre & Gjösætre 1975). The spring cod fishery, the *vårfiskeri* is the most important fishery in Finnmark today. A stationary stock of fjord cod are also available in Varangerfjord year-round (Engelstad 1984; Sund 1968).

Saithe, also known as coalfish, is related to cod, and is found primarily in the waters off Finnmark and north-western Russia. These fish spend much of the year in the open sea, but move close to shore during the summer and autumn (Demel & Rutkowicz 1966: 149; Sund 1968: 256). In Varangerfjord they are fished from June through October (H. Olsen 1967: 24). Haddock is another cod-related species which is relatively stationary in the waters off Finnmark (Sund 1968: 256). It can be found just offshore between May and September (Renouf 1989: 19).

The herring, though not recorded by Helland in 1906 as part of the fishery of inner Varangerfjord, and not identified among the archaeological fish bone recovered in the region, is today an extremely important part of the commercial fishery. Like the cod, the Barents Sea population of herring spawn in the Lofoten region. They feed off the Finnmark coast during the summer and are found in Varangerfjord from August until the onset of winter (Demel & Rutkowicz 1966: 189; H. Olsen 1967: 24). They are most common in the sub-fjords of south Varanger (H. Olsen 1967: 25).

Along with cod, saithe and haddock, Helland (1906) adds cusk, wolffish, and plaice to the pelagic species fished in Varangerfjord. Cusk is found in the inshore waters from

summer through mid-winter, wolffish from mid-winter until June, and plaice spawn in the area in the spring (Demel & Rutkowicz 1967). Other fish also occur in the area but are less frequent and less important to the twentieth century fishery. Halibut (*Hippoglossos hippoglossos*) is a minor component of the modern fishery and is taken in Varanger from June through September (H. Olsen 1967: 22; Sund 1968: 256). As mentioned above in relation to the spring cod fishery, large numbers of capelin (*Mallotus villosus*) spawn along the coast of Finnmark in the early spring, jumping up onto the beaches where they are easily gathered by hand (Sætre & Gjösætre 1975). Though only a minor part of the commercial fishery, these fish are often collected for personal consumption and may have been important in the past because of their ease of capture. Shoals of mackerel (*Scomber scomber*), a southern fish, occasionally migrate as far north as Varangerfjord during the summer months, as do a number of other species including pollack (*Pollachius pollachius*) (Christiansen 1960: 95-96). The ling (*Molva molva*), is fairly common among the prehistoric fish material, but is not fished to any great extent in the area today (H. Olsen 1967).

The rivers and lakes of the Varanger region are also home to a variety of fish species. Salmon (*Salmo salar*) are an anadromous species, which spend most of their adult life at sea, but spawn in freshwater rivers and streams. Salmon spawn in many of the rivers which flow into Varangerfjord, and also in the Tana River which passes roughly 15 km to the west of the head of Varangerfjord. The migration upriver begins in early June and continues through to the end of August (Renouf 1989: 34). Other anadromous fish of the region are sea trout (*Salmo trutta*) and arctic char (*Salvelinus alpinus*). Purely freshwater species include whitefish (*Coregonus lavaretus*), grayling (*Thymallus thymallus*), perch (*Perca fluviatilis*), and pike (*Esox lucius*).

2.6.5 Shellfish

Several species of mollusc populate the intertidal zone and deeper waters of Varangerfjord. Intertidal species include the periwinkle (*Littorina littorea*) and cockle (*Cerastoderma edule*). Both of these can be collected on the beaches at low tide. Other species which live in deeper water (upwards of 5 m) are the Iceland cyprina (*Arctica islandica*), arctic scallop (*Chlamys islandica*), common whelk (*Buccinum undatum*) and horse mussel (*Modiolus modiolus*). Falkenberg (1941) documents several different methods by which the Coast Saami traditionally gathered these shallow-water molluscs

from the bottom of the fjord. They could either be speared from a boat or collected in a trawl pulled behind a boat. The Younger Stone Age occupants of Varanger may have employed similar techniques. They were certainly capable of exploiting molluscs living beyond the inter-tidal zone, since Iceland cyprina is the most commonly identified mollusc in several YSA faunal assemblages (Renouf 1989).

2.7 Setting the scene

The late Younger Stone Age occupants of Varangerfjord lived in a resource-rich environment. Their winters were long, dark and stormy, but summers were warmer than they are today. They positioned their houses close to the shore, providing easy access to numerous species of mollusc, fish and sea mammal. Nearby lakes and rivers also provided fish, and the inland area was home to game birds, herds of reindeer and various fur-bearing mammals. Large flocks of sea birds were available year-round. The birch and possibly pine forest around them could be used for firewood. This ready supply of food and the materials required to produce clothing, shelter and other necessities of life permitted a relatively high density of settlement throughout the YSA in an area which is today one of the least populated regions of the Scandinavian coast.

Nonetheless, there would have been periods of scarcity. The availability of resources fluctuated within any given year; many of the species exploited from the Gressbakken-type houses were most abundant during the spring. This must have been a time of intense activity as people capitalised on the influx of migrating cod and harp seal as well as large breeding colonies of birds. Winters must have been more difficult. Though fjord cod were still present in the fjord, frequent storms may have made the sea inaccessible to small boats and made fishing from land impossible. There were freshwater fish, small mammals, and game birds to be hunted inland, but snow conditions could have made all of these resources difficult to obtain. Even with good conditions for travelling in the interior, none of these species could have been taken in the same numbers as the spring migrants.

Resource availability would also have varied from year to year. The size of wild animal populations tends to rise and fall cyclically and this would have affected the numbers of both resident and migrant species around Varangerfjord. A dramatic change in the

availability of a given species could also occur due to annual changes in migration patterns. The harp seal migration, for example, seems to be tied to ice conditions and the availability of food (Bjørn Bergflødt, pers. comm. 1998). In some years, harp seals are known to arrive on the coast of Finnmark as early as December, and are found in unusually large numbers until June (Helland 1905: 199). This is known as the *kobbeinvasjon*, or harp seal invasion. In other years, very few harp seals migrate into the Varangerfjord (Helland 1905: 199). In the face of such shortages, the YSA occupants of Varanger would have had to find alternatives to their normal dietary staples. They were fortunate to have a considerable variety of resources available to them, and flexibility must have been an important element of their subsistence strategy.

CHAPTER 3

CHANGING THEORIES, CHANGING MODELS: THE HISTORY OF YOUNGER STONE AGE ARCHAEOLOGY IN VARANGER

"Upon those who step into the same rivers flow other and yet other waters"

Heraclitus

3.1 The Stone Age cultural sequence

The standard European cultural sequence of Palaeolithic, Mesolithic and Neolithic, with its various sub-divisions does not apply in arctic Norway. The region is set apart from the rest of Europe by distance and a climate unsuitable for agriculture, and appears to have had more contact with the northern regions of Russia and Finland than with southern Scandinavia (Hood 1992; Schanche 1994). Most of the prehistory of the region involves a "mesolithic" adaptation based on the hunting and gathering of a broad spectrum of resources. While most of Europe was experiencing the Neolithic, the Bronze Age and the Iron Age, Arctic Norway remained unaffected by agriculture or the introduction of metal, maintaining a purely hunting and gathering subsistence until roughly 2000 years ago.

As a consequence, the north of Norway has a unique archaeological sequence, which has been defined and refined by Norwegian archaeologists over the past sixty years. The following discussion is based primarily on the most recent synthesis by Bjørnar Olsen (1994), who divides the prehistory of Finnmark into 3 main periods, the Older Stone Age (*Eldre Steinalder*)[1], the Younger Stone Age (*Yngre Steinalder*), and the Early Metal Period (*Tidlig Metall Tid*) (Table 3.1). Sites mentioned in the text are shown on the map in Figure 3.1.

[1] There has been some inconsistency among scholars in the use of these terms in English. Some opt for Early Stone Age and Late Stone Age (Engelstad 1984, 1985, 1989, Hood 1992, Schanche 1993) as opposed to Older Stone Age and Younger Stone Age (used by K. Helskog 1980, 1984, Renouf 1981, 1989). I have chosen to use the latter, more direct translation from the Norwegian to avoid any confusion with the Early Stone Age (Palaeolithic) and Late Stone Age (Neolithic) of central Europe.

Table 3.1 The cultural sequence of Northern Norway

Period & Phase	Dates (BP)	Main Artefact Types	Main House Type	Major Sites
Older Stone Age (OSA)	10,000 - 5600	flaked stone: blades, cores, burins	tent structures	Komsa Mortensnes
Younger Stone Age (YSA)				
Period I	5600 - 5000	North Varanger: slate knives, bifaces South Varanger: comb ceramics	little evidence of dwellings	Nordli Lossoa's Hus Mortensnes Slettnes
Period II	5000 - 4500	ground slate: Pyheensilta points, single-edged knives	Karlebotn-type house	Gropbakkeengen Slettnes
Period III	4500 - 3500	bone & antler tools, single-edged ground slate knives	early: Nyelv-type house late: Gressbakken-type house	early: Nyelv late: Gressbakken Bergeby
Early Metal Period	3500 - 2000	asbestos ceramics, bone & antler tools	no clearly defined type, houses smaller and less frequent than in YSA period III	Virdnejávri 112 Hellefjord (Sørøy)

3.2 The Older Stone Age

Deglaciation of North Norway following the last ice age began around 14 000 BP (Sollid *et al.* 1973), and the first human occupation dates to roughly 10 000 BP (Damm 1993; Indrelid 1978). The initial settlement appears to have occurred over a very short period along the entire length of the Norwegian coast (Bjerck 1990, 1995; Hauglid 1993; Sandmo 1986; Schanche 1988; Thommessen 1996), yet the question of whether migration occurred from the south or the east remains unresolved (Thommessen 1996: 237-238). The first 5000 years of settlement in the area are traditionally known as the *Komsa culture*, after the Komsa mountain in Alta, where Anders Nummedal found the first evidence of early post-glacial settlement in the region (Nummedal 1927, 1929). Scholars have often criticised the use of the term Komsa since it implies the existence of

a single cultural complex over the entire 5000 year period, when in fact, there is considerable variation in the archaeological record through time (cf. E. Helskog 1974; B. Olsen 1994; Schanche 1988). Bjørnar Olsen (1994) thus avoids the use of the term in his chronology.

The Older Stone Age (11 000-6500 BP / 10 000-5600 BP) has not been subjected to the same intensity of archaeological investigation as the Younger Stone Age, perhaps because the archaeology of the earlier period is less visible on the ground. Nonetheless, the major developments of the OSA have now been delineated by archaeologists, and the recent work of Schanche (1988) and Woodman (1993) has done much to differentiate between phases. The Older Stone Age is characterised by flaked stone technology including blades and cores, burins, and unifacial retouch. Finds of tent rings and wind breaks are known from early in the period (Schanche 1988), and the remains of simple turf houses have been dated to the middle of the period (Simonsen 1961). Schanche (1988) has proposed a trend towards more permanence of settlement throughout the Older Stone Age. Initially, the location of seasonal camps varied from year to year, but gradually groups began to reuse certain camps, repeatedly occupying the same locations at specific times of year.

Settlement evidence is restricted to the coastal areas at the beginning of the period, as much of the interior was still covered in ice (B. Olsen 1994: 38). In the middle of the period, settlement is still concentrated in coastal areas, but there are also indications of at least seasonal use of the interior (Simonsen 1963, 1985, 1986). Towards the end of the period, there is considerably more evidence of settlement in the interior. The large number of inland sites on Finnmarksvidda lead B. Olsen (1994: 40) to suggest that there were groups permanently occupying the interior at this time.

Bone preservation is poor on sites from the Older Stone Age, so there is little direct evidence of resource exploitation patterns. The only excavated faunal remains come from a small midden feature at the site of Mortensnes in Varangerfjord (Schanche 1988: 78-81), which dates to the end of the period (5770±190 BP). The bones, dominated by seal, fish and sea birds, indicate a strong emphasis on marine resources at this coastal site.

3.3 The Younger Stone Age

The Younger Stone Age (6500-3800 cal BC / 5600-3500 BP) has been studied more intensively than any other period in Arctic Norwegian prehistory. Numerous extensive excavations have been carried out around the Varangerfjord (Gjessing 1942; Renouf 1981, 1989; Simonsen 1961; Schanche 1994), on Sørøy (Damm *et al.* 1993; Hesjedal *et al.* 1993, 1996), and in other coastal areas (Andreassen 1985, 1986, 1988; E. Helskog 1980, 1983), creating a regional bias in the archaeological data. Survey and excavation have been fairly limited in the interior, and there is a paucity of information from Finnmarksvidda in particular (B. Olsen 1994: 49). Artefact types indicate continuity from the Older Stone Age to the Younger Stone Age (Hood 1993). The Younger Stone Age is distinguished by the introduction of ground slate technology, which gradually overtakes flaking as the most common technique of lithic manufacture. House remains become far more common, and indicate larger dwellings than previously, and the artefact assemblage is generally more varied (B. Olsen 1994).

The Younger Stone Age was originally divided into four periods by Simonsen (1961) based on his excavations around Varangerfjord. The dates for each period were later revised by K. Helskog (1980) based on a series of radio-carbon dates. More recently, Bjørnar Olsen (1994) has limited the Younger Stone Age to the first three periods, including the fourth period in the Early Metal Period in order to bring the North Norwegian chronology in line with those of surrounding areas in Russia and Finland.

Period I (6500-5700 cal BC / 5600-5000 BP) is characterised throughout Finnmark by bipointed bifacial projectile points. Distinct house features are unknown in this period, except for a small (4 m diameter) shallow structure at Mortensnes in Varangerfjord (Schanche 1988). There are marked differences between the north and south sides of Varangerfjord at this time. The house at Mortensnes, on the north side of the fjord, contained bifaces and slate knives, but lacked ceramics. On the south side of the fjord, the sites of Nordli and Lossoa's Hus lack house remains, have very few slate artefacts, and contain large amounts of Säräisniemi 1-type comb ceramics (Simonsen 1961). The artefact inventories from these coastal sites on the south shore bear a striking resemblance to those from contemporary inland sites along the Pasvik River (Hood 1991; Simonsen 1963). This may indicate two different settlement patterns; seasonal

movements around the coast on the north side of the fjord, and a seasonal movement between coast and interior on the south (B. Olsen 1994: 68). Hood (1994), however, points out that the differences between north and south may relate instead to functional differences between the sites. Outside Varanger, period I material has been found at Slettnes on Sørøy (Andreassen 1985; Damm *et al.* 1993; Hesjedal *et al.* 1996) and there is some evidence of inland-based groups on Finnmarksvidda (E. Helskog 1978; Hood 1991: 54-55; Simonsen 1987).

Period II (5700-5000 cal BC / 5000-4500 BP) is marked by the clear dominance of ground slate technology and the disappearance of flaked stone. The long, thin Pyheensilta-type ground slate points are another important feature of assemblages from this period (K. Helskog 1980; Simonsen 1975). Preserved house structures are more numerous during this period than at any previous time. Two sites with extremely large concentrations of houses are known from period II. The site of Gropbakkeengen in Varangerfjord consists of a minimum of 89 houses (Figure 3.2), with round, oval or rectangular plans, low mounds indicating walls, and floor areas of between 7.75 and 23 m^2 (K. Helskog 1984: 64). The majority of these excavated "Karlebotn-type" houses have a single central hearth (Simonsen 1961: 106-192) (Figure 3.3). Slettnes, on Sørøy, also has a large number of period II houses with a very specialised artefact assemblage similar to that from Gropbakkeengen (Damm *et al.* 1993). The limited range of artefacts on both sites has led to the suggestion that these are specialised sea mammal hunting camps, and represent seasonal aggregations of settlement (Hood 1991: 232, 1995; B. Olsen 1994: 69-71). There are few excavated faunal remains from this period, but small amounts of bone, mainly fish, harp seal and whale, from Gropbakkeengen may suggest a late winter/early spring occupation (H. Olsen 1967, n.d.).

There is little evidence of settlement in the interior at this time. This may indicate a shift from the coast-inland movement on the south side of Varanger in period I to a pattern that was more tied to the coast. Alternatively, it may reflect the difficulty in identifying this period in the interior due to a lack of diagnostic ground slate artefacts in the inland assemblages (B. Olsen 1994: 69).

Period III (5000-3800 cal BC / 4500-3500 BP) is poorly defined typologically. Ground slate continues to dominate among the lithics, and there appears to be a tendency for

single-edged slate knives to outnumber double-edged ones during this period, while the reverse was true during period II (E. Helskog 1983; Schanche 1988; Simonsen 1961). Larger, more substantial houses come into use from the beginning of this period in Varangerfjord, and elsewhere towards the end of the period. In the Varanger region, period III is also characterised by a rich bone technology, including ornately decorated bone artefacts (Myrvoll 1992; Renouf 1981; Simonsen 1961), and the best preserved and most extensive faunal assemblages from the Arctic Norwegian Stone Age (H. Olsen 1967, n.d.; Renouf 1981, 1989; Schanche 1994; Simonsen 1961).

In period III there is a shift from Karlebotn-type houses, with a single hearth, to larger rectangular structures with double hearths (Figure 3.4). These Nyelv-type houses appear transitional between Karlebotn-type and Gressbakken-type houses (Simonsen 1979: 375-376) and are known mainly from the site of Nyelv Nedre Vest (Renouf 1981; Simonsen 1963). Some are known from the end of period two, but they more commonly date to the first part of period III (B. Olsen 1994: 71). They strongly resemble the largest Karlebotn-type houses in their external construction, while the presence of two hearths positioned along the longitudinal axis foreshadows the internal organisation of the later Gressbakken-type houses. Nyelv-type houses appear to have been in use until roughly 4500 BP (K. Helskog 1980; Renouf 1981).

The latter part of period III is often termed the "Gressbakken phase" (K. Helskog 1980: 59; Myrvoll 192: 55; B. Olsen 1994: 90; Simonsen 1975: 246-254). Bjørnar Olsen's use of the term includes the period 4400-3800 BP. Gressbakken-type houses first appear in Varangerfjord around 4300 BP (Schanche 1994: 96-99). Though best known and most intensively studied in the Varanger region, these houses are also found as far west as Slettnes on Sørøy and as far east as the Kola Peninsula in Russia (Schanche 1994). The houses are generally symmetrical and strongly resemble each other, though there is some variation in form (Johansen 1998). The classic Gressbakken-type house is a deep semi-subterranean structure with a rectangular floor plan and two rectangular stone-lined hearths along its long-axis (Figure 3.5). In almost all cases, these houses are oriented parallel to the contemporary shoreline, with a large midden mound along the side facing the water. This midden is bisected by an entrance passage, and there are often two other entrances, one along each of the short walls, and occasionally a fourth entrance at the rear (Schanche 1994; Simonsen 1961). The nature of the houses and associated faunal

remains have led to a consensus among recent archaeologists that they represent semi-permanent or even permanent occupation (Engelstad 1984; Hood 1992, 1995; B. Olsen 1984, 1994; Renouf 1981, 1984, 1989; Schanche 1988, 1992). Semi-sedentary occupations have also been suggested based on the Gressbakken-type houses at Iversfjord (E. Helskog 1983) and similar constructions on Sørøy[2] (Andreassen 1985, 1989), though at a slightly later date than in Varanger. The changing interpretations of past economic and social organisation based on this house type will be discussed at length in section 3.6.

Occupation of the interior region is better understood towards the end of period III. Two sites in Finnmarksvidda have produced radiocarbon dates of around 4800 BP (E. Helskog 1978, 1983). B. Olsen suggests (1994: 76) that the inland evidence from this period indicates both the presence of mobile inland groups and perhaps seasonal fishing camps used by the semi-sedentary coastal groups of Varangerfjord and Tanafjord.

3.4 The Early Metal Period

The Early Metal Period (3800-2000 cal BC / 3500-2000 BP) is defined by the use of asbestos ceramics (K. Helskog 1980; Jørgensen 1986; Jørgensen & B. Olsen 1988) and straight- or concave-based bifacial projectile points (B. Olsen 1994). Few metal finds are actually known from early in the period, but artefacts of both bronze and iron increase considerably beginning around 3000 BP (Hood 1992; Hood & B. Olsen 1988; B. Olsen 1984).

There is a marked trend in the early part of this period towards increased occupation of the interior, particularly along the main drainage systems (E. Helskog 1978; Hood & B. Olsen 1988; Jørgensen & B. Olsen 1988; Simonsen 1963). At coastal sites on the island of Sørøy (Andreassen 1985; Damm *et al.* 1993; Simonsen 1968) and in Iversfjord (E. Helskog 1980, 1983), some of the large house features from period III of the Younger Stone Age continue in use for several hundred years during the Early Metal Period. Within Varangerfjord itself, there is a shift from Gressbakken-type houses to smaller, deeper houses which are more square than rectangular, and lack well-defined entrance

[2] The period III house remains on Sørøy have similar dimensions to Gressbakken-type houses in Varangerfjord, and the same double hearth. However, they are shallower, and lack the large banks,

passages. There is a sharp decrease in the number of known house features throughout the Early Metal Period, and house remains become smaller and less well-defined, indicating a gradual increase in settlement mobility (B. Olsen 1994: 109-124). By the end of the period, there appears to have been a pattern involving seasonal migrations between summer settlements on the outer coast and winter settlements in the interior, which continued into the Saami Iron Age (B. Olsen 1984, Schanche 1988).

3.5 A caution

The dates associated with the major periods and sub-periods presented above apply mainly to the Varanger region, and may have to be pushed back somewhat on Sørøy (Damm *et al.* 1993; Hesjedal *et al.* 1996). Moreover, the interpretations of settlement patterns and the relationship between coast and inland settlement are not as straightforward or as well understood as this brief summary has made them appear, and many are still disputed. There has been a tendency among many researchers to attribute differences in material culture style and composition to social differences between groups. For example, during the transition from Younger Stone Age to Early Metal Period, the inland sites along the Pasvik river and at Virdnejavri are generally assumed to represent the activities of groups occupying the interior on a permanent basis (e.g. Helskog 1974; Hood and B. Olsen 1988; B. Olsen 1994: 111; Renouf 1989: 62; Simonsen 1985). The localisation of the "Pasvik Group" of asbestos ceramics in the interior, and textile ceramics at the coast is seen as a means of signalling the social identities of two distinct groups (Jørgensen & B. Olsen 1987, 1988). However, this is somewhat tenuous given the limited evidence for winter occupation of the inland. The functional distinctions between the lithic artefacts at interior and coastal sites could alternatively be explained by a single group carrying out different tasks in the two areas (Hood 1992, 1994, 1995). Much work remains to be done, even on the YSA period III sites which have to date been the main focus of archaeological excavations.

3.6 A history of Younger Stone Age archaeology

The Younger Stone Age, particularly periods II and III in the Varanger region, has been the subject of intensive archaeological field work and debate since the 1930s.

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middens and clearly marked entrances of classic Gressbakken-type houses (B. Olsen 1994: 75).

Developments in both archaeological and anthropological theory have led to changing models of hunter-gatherer settlement pattern and social structure based on the excavated material. New excavations have also added to the available evidence. There are conflicting ideas about season in which sites were occupied, the level of "complexity" involved in the social organisation and the size of both individual settlements and the overall population.

The main figures in the debate, Anders Nummedal (1936, 1937, 1938), Gutorm Gjessing (1942, 1944, 1945, 1953, 1955, 1975), Povl Simonsen (1961, 1963, 1968, 1974, 1975, 1976, 1979), Ericka Helskog/Engelstad (1980, 1983, 1984, 1985, 1988, 1989), Knut Helskog (1974a, 1974b, 1980, 1983, 1984, 1985, 1988), Priscilla Renouf (1981, 1984, 1987, 1989), Kjersti Schanche (1989a, 1989b, 1992, 1993, 1994, 1995), Elin Myrvoll (1992), Bjørnar Olsen (1994) and Heidi Johansen (1998) will be discussed in terms of the theoretical frameworks within which they work (or worked).

3.6.1 Circumpolar ethnography, egalitarian bands and the seasonal round

The earliest models of Younger Stone Age socio-economics were proposed by Gutorm Gjessing (1942, 1944, 1945, 1953, 1955, 1975) and Povl Simonsen (1961, 1963, 1968, 1974, 1975, 1976, 1979). They were based on an understanding of hunter-gatherer cultures that grew out of ethnographic accounts from the circumpolar region. Both models emphasised an annual cycle in which the base camp was moved seasonally to take advantage of changing resource availability, and where the population dispersed and aggregated at different times of year. These models implied an understanding of hunter-gatherer social structure which was first clearly articulated at the 1966 Man the Hunter conference (Lee and DeVore 1968). Hunter-gatherer societies were seen as egalitarian: they lacked formal leadership, and emphasised the sharing of resources between all group members. A fluid group structure both promoted and resulted from the mobile settlement pattern.

Gjessing and Simonsen were strongly influenced by Mauss' pioneering study of seasonal variation among the Canadian Inuit. Mauss noted that:

> although the settlement is always the fundamental unit of Eskimo society, it still takes on quite different forms according to the seasons. In summer, the members of the settlement live in tents and these tents are dispersed; in winter, they live in houses grouped close to one another. (Mauss 1906, English translation 1979: 36)

He also observed that the seasonal aggregation and dispersion of population were accompanied by changes in social organisation:

> Social life does not continue at the same level throughout the year; it goes through regular, successive phases of increased and decreased intensity.... After the long revelries of the collective life which fill the winter, each Eskimo needs to live a more individual life. (Mauss 1906, English translation 1979: 78-79.)

He maintained that this pattern was essentially universal among high-latitude societies (Mauss 1979: 77-78). Both Gjessing and Simonsen saw the clusters of Gressbakken-type houses around inner Varangerfjord as evidence of large winter settlements and extrapolated dispersed summer settlement elsewhere.

Also important to Gjessing's work, and to a lesser degree Simonsen's, were ethnographic accounts of the Coast Saami, one of several different Saami (or Lapp) groups which occupy the northern parts of Norway, Sweden, Finland, and the Kola Peninsula in Russia. The Saami, though there are still arguments to the contrary, are regarded by many scholars (e.g. Odner 1985; Schanche 1985, 1988) as the direct descendants of the Younger Stone Age populations of the area. An anonymous account from the 1590s (see Storm 1895: 232) describes a yearly cycle with four phases. Summer was spent at the outer fjord fishing and hunting sea birds. In autumn, groups moved inward along the fjord and continued to fish. Winter settlements were located inland for the hunting of reindeer and ice fishing in the freshwater lakes. With the approach of spring, people returned to the edge of the fjord to resume the maritime fishery. Knag's record of the Varanger Saami from 1694 (reprinted 1938) describes a similar seasonal movement between summer fishing locations at the mouth of the fjord, and winter settlements which were either spread around the base of the fjord, or were situated a few kilometres inland.

Gutorm Gjessing, who conducted early excavations around Varangerfjord, was the first to put forward a socio-economic model for the Younger Stone Age. He noted many similarities between the adaptive complex of the Norwegian YSA and that of other prehistoric northern groups. These included similar technological developments such as

toggling harpoons, large skin boats, ulu-type knives and ground slate tools, as well as parallels in social structure and mythology. This led him to propose that the Arctic and Subarctic constituted a large diffusion sphere, with cultural traits passing from Scandinavia to north-eastern North America as part of a "circumpolar Stone Age" (Gjessing 1944, 1953). Gjessing (1955) argued that the prehistoric occupants of Varanger lived in band-type groups, each of which moved between several seasonal settlements around the fjord in a yearly cycle (Figure 3.6a). He maintained that these groups spent the winter in "village" sites along the innermost part of the fjord, at which time their efforts were focused inland on reindeer hunting and ice fishing. They dispersed during the summer months, occupying the outer coast and the small islands near the mouth of the fjord, where fishing, sealing, and whaling where the main subsistence activities. Clearly, Gjessing transferred the Saami ethnographic pattern directly and uncritically onto the prehistoric occupants of the region.

Povl Simonsen, who began excavating in the Varanger area in the 1950s, elaborated upon Gjessing's model, making slight changes based on new archaeological information (Simonsen 1974, 1979). Simonsen agreed with Gjessing that the inner fjord sites with Gressbakken-type houses represented the main winter settlements (Figure 3.6b). He based this interpretation on Håkon Olsen's (1967, n.d.) analysis of the faunal remains from the excavated middens, which indicated a winter-spring occupation for these sites. However, H. Olsen's work also demonstrated that the main food species at these sites were marine and not terrestrial as Gjessing had proposed. Among the material which Olsen identified from YSA sites around Varanger, sea mammals comprised 45%, fish 37%, birds 10% and land mammals only 8% (H. Olsen n.d.: 2).

Håkon Olsen's (1967) argument for a winter-spring occupation of the Gressbakken-type houses was based on the fish and bird remains. His analysis indicated that cod (*Gadus morhua)* was by far the most common fish, accounting for 78% of all fish remains, while saithe (*Pollachius virens*) formed 11% and haddock (*Melanogrammus aeglefinus*) 10% (H. Olsen 1967: 37). When compared with modern fishery statistics (Table 3.2), the relative percentages most closely resemble the modern winter-spring fishery. He argued for summer abandonment of the sites based on the low percentages of saithe, which today dominate the summer fishery, forming over 80% of the summer catch. Olsen argued further that the large numbers of winter migrants among the bird species, the

paucity of summer migrants, and the complete lack of any immature bird bones or salmon bones at the Varanger sites supported his interpretation of summer abandonment.

Table 3.2 Annual catch of cod (*Gadus morhua*), saithe (*Pollachius virens*) and haddock (*Melanogrammus aeglefinus*) in Finnmark county in 1949 (after H. Olsen 1967, Table 6)

	Whole year		**Whole year except summer**		**Spring only 27.3-25.6**		**Summer only 26.6-30.9**	
	Ton	%	Ton	%	Ton	%	Ton	%
Cod	44 869	49.5	43 972	72.0	26 024	88.4	897	3.0
Saithe	31 611	34.9	7 597	12.4	1 580	5.4	24 024	81.2
Haddock	14 175	15.6	9 497	15.6	1 843	6.2	4 678	15.8
Total	90 655	100	61 056	100	29 447	100	29 599	100

Simonsen (1974, 1979) maintained that at the end of the winter, the large settlements at the head of the fjord dispersed into smaller family-based groups for the remainder of the year. Spring was spent on the outer coast where sea birds, eggs and feathers were important resources, along with saithe. He had no archaeological evidence for these settlements, and drew heavily on ethnographic accounts from the circumpolar region. During the summer, groups moved inland along the rivers to exploit the annual salmon run. This claim was prompted by the discovery of settlements along the Pasvik river which Simonsen believed formed part of the same settlement system as the fjordal sites. These river sites consisted of outdoor hearths and Gressbakken-type houses of a lighter construction than those along the fjord (Simonsen 1963). Unfortunately, these sites do not contain preserved faunal remains. Simonsen located the autumn settlements in the hills of the interior, where reindeer hunting was the main activity. Here again, there is no archaeological evidence to support the claim, and Simonsen was drawing on reports of Saami hunting settlements in the interior during the colder months of the year.

Faced with questions of settlement and population size, both Gjessing (1942, 1975) and Simonsen (1954, 1976, 1979) assume that all of the house features at each site are contemporaneous, and that they represent Younger Stone Age "villages". In doing so, they repeat an assumption made by Anders Nummedal (1937: 75-77), who was the first to recognise the great age of the house depressions around Varanger, and who

conducted the first excavations at Nyelv and Karlebotn (Nummedal 1936, 1937). Simonsen argues for a fairly stable population size in Varanger throughout the Younger Stone Age:

> Turning to the fishing settlements as a whole, the small huts of the earlier periods were crowded in clusters of thirty to forty each while in the later periods there were ten to fifteen big houses on each site, indicating a relatively stable number of inhabitants in each "group". Just as among the Eskimos of North Alaska the houses were arranged in rows separated by a kind of main street, the back of the houses of the lower row facing the sea and near to the high tide mark. The doors of the houses faced the street, not the sea in the early periods, but with the introduction of the entrance corridor all the houses had to face the sea because of the drainage terrain. (Simonsen 1972: 188)

Based on estimates of floor space per family unit derived from ethnographic accounts, Simonsen argues that the Karlebotn-type houses represent nuclear family dwellings, and that the larger Gressbakken-type houses indicate extended- or multi-family dwellings (Simonsen 1979). He estimates, based on the same ethnographic data, that a nuclear family house contains an average of 6 people, while an extended- or multi-family house holds an average of 12 people. Based on an average of 20-30 Karlebotn-type houses per site, and 10-15 Gressbakken-type houses per site, he extrapolates village sizes ranging between 130 and 150 individuals (Simonsen 1979: 364-378).

Both Gjessing and Simonsen were overly keen to infer Younger Stone Age behaviour patterns directly from the ethnographic record. This has led to two main weaknesses in their arguments. First, both postulate parts of the seasonal round for which there is no archaeological evidence. Second, both assume a fixed, stable pattern of seasonal activity and location of residence. This probably stems from a long-standing tradition of ethnographic reporting that describes the idealised seasonal round of a group (e.g. Binford 1978; Gubser 1965; Knag 1938; Tanner 1979). In fact, there is often a great deal of variation within a group both at any given time, and from year to year (Jochim 1993). The seasonal rounds of family units within the same group may be quite different, and the movements of group members may also change from year to year.

It follows from this that seasonality determinations are problematic. The Gressbakken-type houses, which were obviously occupied over several, if not many years, may represent a palimpsest of activities which varied from year to year. The seasonal

indicators will represent the sum of activities over the entire period of occupation, blurring any variability which may have existed. This is particularly true given that Simonsen did not record the provenience of the faunal material within each midden. The seasonal picture to emerge from these and almost any other faunal data will therefore be archetypal to some degree.

3.6.2 Sedentism, coastal resources and "complexity"

With the 1980s came a reaction against the established "Man the Hunter" (Lee and DeVore 1968) view of hunter-gatherers as small, highly mobile, egalitarian groups. There was a recognition that among other things sedentism, social stratification, economic inequalities, strict territoriality, and private ownership of resources, were in fact present in some hunter-gatherer communities (e.g. Price 1981; Price and Brown 1985). A dichotomy was established between traditional (or "simple") and "complex" hunter-gatherers. The latter are characterised by larger sedentary or semi-sedentary communities, social stratification involving inherited status, and a "delayed return" economy dependent on storage technology (e.g. Keeley 1988; Woodburn 1982). Complex hunter-gatherers also tend to have high population densities, prestige goods, and high levels of violence associated with the struggle for territory and access to resources (see Table 1.1) (Ferguson 1983; Testart 1982; Watanabe 1983).

Priscilla Renouf (1981, 1984, 1987, 1989) framed her studies of Younger Stone Age Varangerfjord in the notion that northern maritime societies share certain features conducive to the development of complexity. She maintains that the distribution of coastal resources, which tend to vary seasonally rather than spatially, means that they can be effectively exploited from a single main settlement. She argues further that the development of social and economic complexity are directly related to this sedentary lifestyle (Renouf 1989: 9). From this perspective of environmental determinism, Renouf re-assessed the archaeological evidence from Varanger, and conducted further excavations at the site of Nyelv Nedre Vest. She was one of several archaeologists working in different regions to claim evidence for social complexity among archaeological hunter-gatherers (e.g. Rowley-Conwy 1983; Price & Brown 1985).

Renouf (1981, 1989) argues for potentially year-round occupation at many of the sites in Varanger (Figure 3.6c). While the original excavations focused only on the house

features and the associated middens, Renouf excavated larger areas between the houses, and found outdoor hearths and activity areas, suggesting summer activity. She also re-interpreted the results of Håkon Olsen's (1967, n.d.) faunal analysis. As a zoologist, one of Olsen's main goals was to use measurements to detect the presence of subspecies as a means to discuss evolutionary change. This work required a large sample size, and he therefore grouped the material from all of the sites into a single sample. In doing so, he overlooked any variation within or between sites.

Renouf divided the faunal material according to the midden features from which it was originally excavated. Like H. Olsen, she used the relative percentages of different fish species in order to determine the seasonality of each midden. Cod was the most prevalent fish species in all of the middens, suggesting the exploitation of the annual spring cod migration up Norway's northern coast. However, a number of middens from several different sites displayed lower percentages of cod and larger amounts of saithe than those found in the Varanger averages. According to Renouf, this reflects the summer fishing of saithe in addition to the winter-spring cod fishery. Renouf also used the presence of spring-summer and autumn-winter migratory bird species at certain houses to argue for year-round occupation.

Renouf's model is open to the same criticism as that of Gjessing and Simonsen; it presents a static picture of late YSA settlement and society. However, Renouf points out that the seasonal patterns of northern maritime hunter-gatherers are generally more stable than those of other hunter-gatherer groups (Renouf 1989: 5; see also Koyama & Thomas 1982; McCartney 1974, 1975, 1988; Nash 1983). This stability is often attributed to the abundance and predictability of northern coastal resources (Broadbent 1979). Large seasonal migrations of fish and marine mammal species to the coast provide a reliable influx of food around which local inhabitants structure their activities. If this was, indeed, the case in Varanger, the "averaging affect" of a palimpsest assemblage (see section 3.5.1) may be less serious here than elsewhere.

Ericka Engelstad, working at the same time as Renouf, also argues for increased sedentism in the late YSA, but stresses variability in settlement patterns based on her excavations at Iversfjord (E. Helskog 1980, 1983, 1984). She illustrates significant differences in the representation of major faunal classes at Iversfjord, Nyelv and

Gressbakken Nedre Vest (Engelstad 1984: 13). These differences, however, probably result more from the screening techniques used during excavation than from subsistence strategies in the past (see section 5.4). Less spurious is Engelstad's correspondence analysis of the lithic artefacts from Iversfjord (E. Helskog 1980, 1983) and the Varanger-Pasvik area, which shows a high level of both inter- and intra-site variation. She maintains that the activity variation demonstrated within the general pattern of permanent or semi-permanent coastal residence was the product of a highly flexible group structure designed to adapt to changing resource availability (Engelstad 1984: 20). She also argues for small autonomous settlements, suggesting that no more than one or two houses at Iversfjord were occupied simultaneously (E. Helskog 1983: 147-148). Thus, Engelstad, though she agrees with Renouf that the settlement pattern of the Younger Stone Age involved a high level of sedentism, does not agree that the social organisation was fixed and hierarchical.

Knut Helskog (1984) largely agrees with Engelstad's socio-economic model, and maintains that Simonsen greatly over-estimated the size of individual settlements. Helskog does not dispute Simonsen's estimates of the number of individuals occupying each house type, nor the contention that Karlebotn-type houses represent single-family households while Gressbakken-type houses indicate multiple-family dwellings. However, he argues that only between one and six houses would have been occupied at each site at any given time during periods II and III of the Younger Stone Age. He postulates an average of five to eight nuclear families per site during period II, which translates to between twenty and thirty people per settlement (K. Helskog 1984: 65). He argues further that the Gressbakken-type sites held an average of four families, each with an average of four individuals. This means that the population of the semi-sedentary coastal sites might have ranged from sixteen to ninety-six individuals, and Helskog (1984: 65) suggests that most settlements consisted of between forty and sixty individuals.

3.6.3 Structuration theory

In the early 1990s, several scholars applied structuration theory, as developed by Anthony Giddens, to the archaeology of the Younger Stone Age, producing two very different interpretations of YSA culture. Perhaps the most important tenet of Giddens' (1979, 1981, 1984) theory relates to the duality of social structures as both a cause and

effect of behaviour. Existing social rules influence individual behaviour, while at the same time daily activities can either reproduce these unwritten codes or work over time to shape and reshape them. This ongoing interaction between cultural norms and individual behaviour is what Giddens terms "social structuration". The process both constrains and enables individual action, for while social structures limit possible action, they also incorporate many possibilities for action (Giddens 1979: 60-73, 1984: 16-28).

Further, Giddens (1979: 88-93, 1981: 162-206, 1984: 14-16) believes that all social change is motivated by inherent oppositions between social structures. All structural principles have one or more opposing principles, which can generate social conflict and precipitate change. In fact, all social interactions involve a "dialectic of control", whereby reciprocal relations of autonomy and dependence lead all members of the community to attempt to influence the outcomes of these interactions. Because individuals have an incomplete knowledge of the system within which they operate, such actions can produce both the desired results and unexpected ones.

Schanche (1994), Myrvoll (1992) and B. Olsen (1994) all use structuration theory to argue for a high level of social complexity among the occupants of Varangerfjord during YSA period III. All argue for the presence of such hallmarks of "complexity" as high population density, large communities, prestige goods and high levels of violence. They maintain that increased sedentism and population density at the end of the Younger Stone Age produced considerable social stress within the community. They see evidence for this stress in the symbolic aspects of the archaeological record. Opposing social forces eventually led to the breakdown of the entire social structure causing the disappearance of the Gressbakken house type and a return to a more mobile settlement pattern.

Schanche (1994: 199-230) argues that the increase in sedentism throughout the Younger Stone Age resulted in increased social stress and a need for stronger social controls. A shared system of symbols would have highlighted the shared beliefs of individual members of society and strengthened their sense of place within the community. She interprets the symmetrical structure of the Gressbakken-type house as a symbol of the idealised social structure within late YSA society. According to Schanche's model, the division of space within these houses reflects divisions within the culture, for example

between men and women, and serves to both objectify and legitimise such divisions. The strong similarities between houses reflect the severity of internal social tensions and the need to reinforce the status quo.

Bjørnar Olsen (1984: 211-212) also argues for increased social stress during the late Younger Stone Age. He maintains that rising social tensions are indicated by an increase in symbolic production in the form of animal figurines and ornamentation on artefacts (e.g. Hodder 1982). Myrvoll (1992) interprets symmetry and asymmetry in the ornamentation on bone and antler artefacts as an expression of the conflicts between various sub-groups within late Younger Stone Age culture. She argues that the dominant power groups, perhaps older men, symbolised and legitimised their power through symmetrical designs on harpoons. While the presence of asymmetrical designs on combs and points represents an attempt by less powerful members of the community (women) to subvert the dominant power structure.

Schanche, Olsen and Myrvoll also claim that violent death often resulted from the high levels of social conflict which they postulate for the late Younger Stone Age (Myrvoll 1992: 153-154; B. Olsen 1994: 92-93; Schanche 1994: 196). A bone point was found near the clavicle of an individual buried in a midden at Nyelv (Renouf 1981: 144-145). While Olsen and Schanche maintain that this point was the cause of death, and is evidence of physical violence, it could easily have been placed in the grave as an offering (2 other points were also found in the grave). Two human skulls, one from Nyelv and one from Gressbakken Nedre Vest also had fractures which might indicate a blow with a sharp object (Torgersen *et al.* 1959). Neither of the fractures had begun to heal, however, so they might have occurred after death. Few human remains have been found dating to YSA period III, and little is known of burial practices during the period. The few burials found during excavation of dwellings may represent unusual cases. Thus, the evidence cited for an increase in violent death is both limited and questionable.

One of Schanche's most interesting and convincing arguments is for two distinct territories around the Varangerfjord (Schanche 1994: 168-171, 1995). The distribution of Gressbakken-type houses on the coast of Varangerfjord clusters in two areas: one in the inner-fjord and another in the sub-fjords on the south side of Varangerfjord (Figure 3.7), perhaps indicating a territorial border between two social groups. The two areas

are divided by a long stretch of coastline where Gressbakken-type houses are completely absent. This area has been extensively surveyed (Kjersti Schanche, pers. comm.), so the absence of house depressions between Nyelv in the west, and Bugøyfjord in the east is not merely a product of archaeological sampling technique. Nor can it be given a natural explanation, as there is nothing to distinguish this area topographically from the occupied areas of coast (Schanche 1994: 168).

Schanche (1994: 182-198) and B. Olsen (1994: 86-87) see three levels of a hierarchical social organisation reflected in the distribution of Gressbakken-type houses. Individual houses represent residential units of two (or more) families. Each site represents a "local group" (*lokalsamfunn*), which may have had an individual leader, and each cluster of sites represents a territorial group; a "society" (*samfunn*). Schanche (1994: 178-187) suggests that a single large site within each territorial group represents a central "administrative centre", which was home to the leader (or leaders) of the entire territory. She believes that these leaders were responsible for the collection and redistribution of surplus resources. Surplus goods may also have been used in long distance trade for "prestige" items used to signal power. Schanche argues that the copper dagger found at Karlebotnbakken originated in Russian Karelia and indicates this kind of exchange (Schanche 1989, 1994: 193-196).

Increased population pressure is an integral part of this model and Schanche (1994: 172-177) argues for a return to Simonsen's large estimates of settlement and overall population size. She argues that K. Helskog (1984) was uncritical in his use of radio-carbon dates to determine the number of houses occupied contemporaneously at late YSA sites. When the standard deviation of the dates is included, many of them overlap (see Table 4.1). She also argues that Helskog's estimate of a 30-50 year lifespan for each house is too low, and that with maintenance, a Gressbakken-type house might be used for an average of 150 and a maximum of over 200 years. Accounting for as yet undiscovered house depressions and those destroyed by modern activity, Schanche postulates a total of 75 occupied houses in the inner fjord, and 50 on the south side of the fjord at any given time. She estimates an average of 10 people per house, which means a total of 750 and 500 people in each of the two territories respectively. She believes that at Bergeby and Kalkillebukta, the two sites with the largest number of house depressions, the population may have reached around 200.

Hood (1992, 1995) also frames his analysis of Norwegian Stone Age lithic technology in structuration theory, but arrives at very different conclusions from those of Schanche, Myrvoll and B. Olsen. Hood aims to test the arguments for social complexity during the late YSA by examining the way in which lithic resources were manipulated by individual agents as part of the "dialectic of control" (Hood 1992: 286). He maintains that in egalitarian societies, decision-making structures are situational. They are invoked when the need arises, and do not necessarily involve the same people in positions of power each time they are used (cf. Johnson's 1982 sequential hierarchies). In non-egalitarian groups, permanent hierarchical decision-making structures are in place (cf. Johnson's 1982 permanent hierarchies), ensuring differential access to resources for individual group members (Hood 1995: 77). Hood, then, is concerned with "asymmetries in the distribution of material, social, or symbolic resources, and [whether] these asymmetries [are] reproduced over time and space" (Hood 1995: 77).

If certain individuals within the late YSA community maintained power on a permanent basis, Hood (1992: 270-289, 1995) predicts: differences between domestic units in terms of lithic production, exchange of local and exotic stone within supra-regional trade systems, and the use of exotic raw materials or artefacts as symbols of status. However, there is a continuity of lithic raw materials from period II to period III, a scarcity of exogenous ("exotic") lithic raw materials during the Gressbakken phase, and there are strong similarities between the lithic assemblages at all Gressbakken-type houses. All of these factors suggest a social system with common access to resources and a high level of autonomy within each domestic unit.

Incorporating evidence for subsistence-settlement and ritual activity into his study of the lithics, Hood (1995) argues that much of the traditionally cited evidence for complexity is unfounded. He feels that mortuary data have been used uncritically to argue for social differentiation. There are an extremely small number of burials known from the YSA. Several rock mound burials are known from Gropbakkeengen and Nyelv Nedre Vest (Simonsen 1961; Torgersen *et al.* 1959), and a complete inhumation was found in a midden feature at Nyelv (Renouf 1989: 99). A child's skeleton was found under a house-floor at Advik, and several fragments of human bone were found in the middens at Gressbakken Nedre Vest (Torgersen *et al.* 1959). Renouf (1981: 176-177) suggests that

the two burial types, mound and midden, might indicate differences in status. Bjørnar Olsen (1994: 95), on the other hand, believes that the apparent temporal shift from grave mounds to deposits of disarticulated bone in middens indicates a change from a system of visibly marking high status burials to one of downplaying status differences in order to mask internal social conflicts. Hood (1995: 86) argues that the concept of burial mounds as indicators of status is undermined by the scarcity of grave goods, and that the taphonomic history of the middens should be explored before assuming deliberate burial of the isolated human bones. This author believes that the evidence for human burial practices is currently far too limited and the dates too insecure to permit any generalisations about social organisation. The variation in burial types may well relate to methods of marking or masking social status, but could equally well have more functional grounds. For instance, bodies might have been buried in summer (in cairns or middens) and exposed during the winter.

The presence of south Scandinavian flint, Russian flint and Finnish asbestos (used to temper ceramics) on YSA sites in Varanger has been used to argue for long distance trade networks (Renouf 1981: 235, 1984: 24, 1988: 109; Simonsen 1975a: 170-171, 1975b, 1979: 419-420). However, Hood (1992, 1994, 1995) has demonstrated that much of the "south Scandinavian" flint can be found naturally on the beach terraces of Varanger as a result of glacial activity, and the "Russian flint" may in fact be jasper from northern Finland. He has also discovered local sources of asbestos in Finnmark, proving that the ceramics could have been produced locally.

Hood (1995) concludes that while situational hierarchies may have existed during the late YSA in Varangerfjord, perhaps to organise communal whale hunting, there is no convincing evidence for the permanent hierarchies associated with "complexity". He agrees that the Gressbakken-type houses indicate semi-sedentary settlement and that they do not fit the baseline hunter-gatherer model. However, he is unwilling to label late YSA society "complex" and prefers the idea of "emergent complexity" in terms of new roles and social sub-groups such as shamans, community leaders and territorial groupings (Hood 1995: 88).

3.6.4 A post-structural critique

Heidi Johansen (1998) has criticised many of the tenets of the argument put forward by Schanche, Myrvoll and B. Olsen. She argues that most of their interpretations of the Younger Stone Age are based on developments at a limited number of sites in the inner-most part of Varangerfjord, which are then extended over a much broader area. They stress a sedentary lifestyle and the homogeneous, symmetrical pattern of house construction as indicators of a hierarchical social organisation and increasing social stress which eventually cause the collapse of the entire social system (Johansen 1998: 23). This despite a high degree of variation in house forms, and Schanche's own suggestion of alternative, more mobile settlement patterns outside of inner Varangerfjord (Schanche 1994: 164).

Johansen is primarily concerned with the transition from Younger Stone Age to Early Metal Period. Schanche, Myrvoll and B. Olsen interpret this transition as a shift from sedentary to mobile settlement patterns, from a hierarchical to a more egalitarian social organisation, and from a maritime resource base to a growing focus on inland resources. Johansen argues that the "Gressbakken" house type is far more varied than has been previously acknowledged. The strong similarities between excavated houses relate to the tendency of archaeologists to select only classical examples of the house type for investigation (Johansen 1988: 106-109). While there is definitely variation between the Gressbakken-type houses, the existence of a distinct "type" is hard to deny. Among the many different sites with houses depressions distributed around Varangerfjord, "Gressbakken-type" settlements are immediately recognisable as such because of their size, their large banks, and their clearly-marked entrance passages. This investigation will be confined to classically defined Gressbakken-type settlements in Varanger mainly because these are the sites which have produced the largest bone assemblages. This is not to deny that the smaller house depressions with twin linear hearths found outside Varanger during YSA period III are also "Gressbakken-type" houses, despite their lack of clearly marked entrances.

Moreover, only in the inner part of Varangerfjord is there a shift from Gressbakken- to Mortensnes-type houses in the Early Metal Period. In the outer fjord, the Gressbakken house type continues in use, and in West Finnmark both large and small house structures occur from 4000 to 3000 BP. While new elements, such as asbestos ceramics appear at

this time, other artefact types including tanged points, and single-edged slate blades continue well into the Early Metal Period. Bjørnar Olsen's (1994) re-definition of period IV of the Younger Stone Age created the Early Metal Period, and emphasised the differences between YSA period III and the Early Metal Period. Johansen maintains that the population density and social complexity of the late YSA have been systematically over-estimated by B. Olsen, Schanche and Myrvoll, and that there is a much greater degree of continuity between the two periods than is generally accepted. While she is very critical of their structural interpretation and their emphasis on oppositions and change, Johansen does not propose an alternative model.

3.7 A final word on seasonality

As mentioned above (section 3.5.2), the difficulty of determining the seasonality of a palimpsest assemblage may be ameliorated somewhat by the more stable seasonal round which generally characterises northern coastal hunter-gatherer societies.
However, methods of seasonal determination based on the fish remains and the presence of indicator species (Hufthammer n.d.; H. Olsen 1967; Renouf 1981, 1989) are problematic in several ways. Firstly, the validity of using modern fishery statistics to interpret fishing practices from 4000 years ago is open to question. Differences between YSA and modern fishing technology doubtless affect the numbers of each species being caught. Fluctuations in the modern market value of different fish species probably also help to determine their relative importance in the annual commercial catch. Engelstad (1984) points out that cultural preferences, past and present, might also play a significant role in the representation of the different species. Nonetheless, the modern fishery statistics reflect broad trends in the seasonal availability of each fish species, and the proportional representation of these species in a YSA midden likely gives a reasonable indication of the season of occupation. It should, however, be remembered that fjord cod, not widely exploited by the modern offshore fishery, are present in Varangerfjord year-round, and are not merely a spring indicator.

More troublesome is the reliance on the presence of certain indicator species to determine season of occupation (H. Olsen 1967; Renouf 1981, 1989; Schanche 1994). Many of the bird and some of the marine mammal species of Varanger are migratory and are today found in the region only at certain times of year. Assuming that these

migration patterns have remained unchanged since the Younger Stone Age (a reasonable assumption, and one which is proven for the harp seal in Chapter 6), the presence of such species on an archaeological site indicates hunting activity within a limited period of the year. Renouf (1989: 22-43, 173-218) and Schanche (1994: 158-165) also assume that some taxa, though available year round, would only have been hunted at certain times of year (e.g. reindeer hunted primarily in autumn).

The difficulty with this method is that while it can show seasonal activity on a site, it cannot prove *absence*. It can thus reveal the strongly seasonal nature of activity on a site, or show the *potential* for year-round occupation, but a level of doubt will always remain. Renouf's (1981, 1989) analysis of seasonality based on the excavated faunal remains from YSA middens around Varangerfjord shows that in almost all cases, species availability spans the entire year. However, a period of only a few months in the spring, when the summer and winter migratory birds are both resident in the area could also produce the same species list (Figure 3.7). Many of the bird species used by both Renouf (1989: 173-218) and Schanche (1994: 151-153) as seasonal indicators are also represented by only a very small number of fragments, and they are given far more weight than they deserve in determining season of occupation at the site.

Despite these shortcomings, the two methods described above represent the best means available of determining the season of occupation of the Varanger sites. When used in conjunction with the nature of the dwellings and other features, such as external hearths, they can usually give a reasonable indication of the season of occupation. There are two other, more precise techniques which can be used for seasonal determination. The first relies on canine tooth sections (see section 6.4.1), the second involves measuring mammalian longbones[3] (see section 6.4.3). Any of the mammalian species suitable for these methods are either found in small numbers in the Varanger assemblages (e.g. whale, bearded seal, harbour seal, grey seal, and reindeer) or are seasonal migrants to the area (e.g. harp seal and ringed seal). Those found in small numbers produce insufficient sample sizes of tooth sections and longbone measurements. Those that are only available seasonally cannot be used to determine the time of year when a site was occupied by humans, since they provide information on only the season or seasons in which they

[3] The technique can only be applied to mammalian species such as reindeer, harp seal and harbour seal, which give birth to their young during a short period each year.

themselves are resident in the area[4]. However, both tooth sections and longbone measurements can be used to discuss the timing of the seal hunt and the seal hunting strategies employed in Varangerfjord during the late Younger Stone Age (see Chapter 6).

3.8 Unresolved questions

Despite their very different theoretical backgrounds, there are some striking similarities between Renouf's argument on one hand, and that of Schanche, Myrvoll and B. Olsen on the other. Schanche, Myrvoll and B. Olsen are critical of Renouf for her deterministic association between natural environmental conditions (i.e. the year-round availability of coastal resources), sedentism, and social complexity. Yet their own argument is founded on the assumption that increased sedentism, for which they give no explanation, and the resultant increase in population (cf. Kent 1989; Koyama & Thomas 1981; Nash 1983; Price 1981; Price & Brown 1985) cause internal social stress which is reflected in the archaeological record.

Johansen has criticised the work of Schanche, B. Olsen and Myrvoll for over-emphasising stress and resultant social change. The argument for high levels of social stress is based on evidence of a rigid symbol system, which supposedly masks social tensions (cf. Hodder 1982). Johansen argues that symbolism during the late YSA is less rigid than Schanche and the others maintain, and that there is considerable continuity between the late YSA and the Early Metal Period. Hood has also shown that much of the evidence previously used to argue for social complexity in the late YSA using a "checklist" approach does not stand up to scrutiny.

While there seems to be consensus on the semi-sedentary nature of the Gressbakken settlements (at least in the inner part of Varangerfjord), questions of settlement size and the level of social complexity remain unresolved. Schanche has probably over-estimated the level of social hierarchy during the late YSA. She goes so far as to liken it to the settlements of the Northwest Coast of North America, where the potlatching system of

[4] Seasonal migrants can provide only partial information on the season of human occupation at an archaeological site. They cannot provide information about the time of year, often six to ten months, when they are absent from the area.

competitive gift-giving was a means of resource distribution. She also suggests the possibility of a slave class (Schanche 1994: 194-195, 198). At the same time, Engelstad and K. Helskog may have underestimated both settlement size and the level of social differentiation. A closer analysis of the faunal material from the late YSA sites of Varangerfjord may help to place the society of the time more precisely between these two extremes.

CHAPTER 4

THE BONE ASSEMBLAGES

4.1 Introduction

This chapter presents the Gressbakken phase faunal assemblages which form the basis for this investigation. The excavations were carried out by several different archaeologists between 1954 and 1991. Developments in excavation techniques, such as the introduction of sieving, mean that the level of recovery varies greatly between excavations. This is particularly true in the case of small-boned taxa such as fish, and does not affect the large mammalian taxa to the same degree. A full discussion of the problems of differential recovery and other taphonomic considerations follows in Chapter 5. Here, unadjusted NISP values are presented as a rough indication of the relative importance of various taxa, and general trends in faunal exploitation at each site are considered.

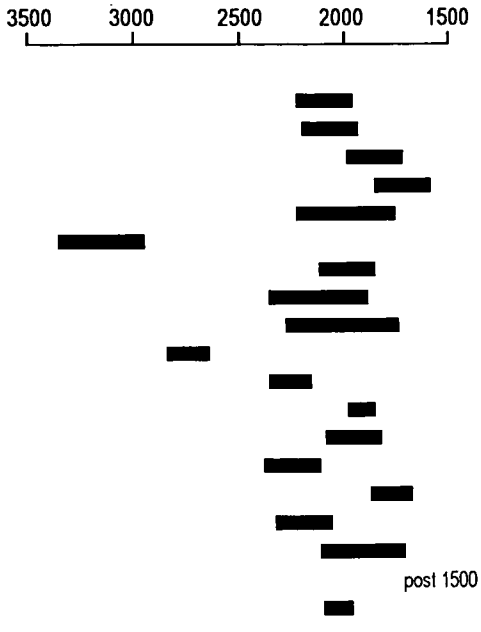
4.2 The study sample

The sites in the study sample were selected for the size of their faunal assemblages and to provide as wide a spatial distribution as possible around the fjord (Figure 4.1). Unfortunately, there is a bias towards the inner-fjord because this area has traditionally been the primary focus of excavation. Large Gressbakken phase faunal assemblages have been recovered from Bergeby (Schanche 1994), Karlebotn (Schanche 1989a, 1994), Advik (Simonsen 1961: 213-247) and Gressbakken (Simonsen 1961: 271-392). Faunal samples from the Sør-Varanger area, which encompasses the many inlets on the south side of the fjord, are generally small. This can be partly attributed to the fact that Simonsen's excavations there sampled only small amounts of midden (Simonsen 1961, 1963). However, Kjersti Schanche's (1994) more recent excavations at Kalkillebukta exposed approximately fifty percent of the accumulated midden at each of two Gressbakken-type houses. In both cases, the midden deposits were thinner and contained fewer, less well preserved bones than those excavated at sites closer to the head of the fjord.

All of the selected faunal samples come from middens associated with classic Gressbakken-type houses, and have produced radiocarbon dates ranging from 3850±100 BP and 3390±110 BP (Table 4.1). Three exceptions to this are an earlier date from Karlebotnbakken, an earlier date from Gressbakken 3 and a much more recent date from Kalkillebukta 17. The earlier date of 4480±90 BP (T-7742) from Karlebotnbakken is on a sample of pine charcoal. Schanche (1994: 98) argues that this date, which is earlier than the other two radiocarbon dates from the same house feature, is not representative of the period during which the house was in use. Pine is a long-living tree species not prone to rot, and may already have been several hundred years old when it was burnt at the site (ibid). Marine shell can similarly provide a radiocarbon date earlier than the context in which it is recovered. The shells of long-dead molluscs could have been returned to a site accidentally during food gathering (Schanche 1994: 98-99), or collected deliberately given the modern human tendency to collect natural objects from the seashore. This might explain the slightly earlier date of 4180±90 BP (T-1917) obtained on shell found in the midden at Gressbakken 3. A date from the floor of the house was somewhat more recent. However, one of Schanche's (1994) aims was to illustrate that Gressbakken-type houses were a short-lived phenomenon, and she may have been too quick to discard these "anomalous" dates.

Table 4.1 Radiocarbon dates from the YSA Period III features which comprise the study sample

Late Period III ("Gressbakken phase") Sites	^{14}C years BP	cal BC
Bergeby 18, hearth (birch charcoal; TUa-267) [2]	3690±85	2210-1965
Bergeby 18, floor (birch charcoal; TUa-266) [2]	3665±95	2190-1925
Bergeby 18, midden (birch charcoal; T-9869) [2]	3520±105	2025-1740
Karlebotn 1, hearth (birch charcoal; T-7743) [2]	3390±110	1880-1530
Karlebotn 1, floor (birch & fir charcoal; T-7744) [2]	3640±140	2200-1790
Karlebotn 1, midden (fir charcoal; T-7742) [2]	4480±90	3350-2940
Advik B, midden (shell; T-2058) [1]	3600±80	2140-1905
Advik J, floor (unid'd charcoal; T-233) [1]	3750±150	2460-1960
Gressbakken 3, floor (unid'd charcoal; T-198) [1]	3650±150	2280-1785
Gressbakken 3, midden (shell; T-1917) [1]	4180±90	2905-2680
Gressbakken 4, midden (unid'd charcoal; T-234) [1]	3850±100	2470-2145
Gressbakken 23, midden (shell; T-2240) [1]	3520±40	1980-1865
Gressbakken 23, midden (shell; T-2060) [1]	3600±90	2130-1830
Gressbakken 23, midden (pine charcoal T-2475) [1]	3800±70	2450-2140
Kalkillebukta 7, hearth (unid'd charcoal; T-9848) [2]	3475±70	1890-1700
Kalkillebukta 7, post-hole (birch charcoal; TUa-265) [2]	3765±80	2325-2027
Kalkillebukta 7, midden (unid'd charcoal; T-9860) [2]	3560±170	2140-1690
Kalkillebukta 17, floor (unid'd charcoal; T-9849) [2]	1785±80	340-125 AD
Kalkillebukta 17, midden (unid'd charcoal; T-9861) [2]	3655±50	2135-1965



[1] Dates from Helskog 1978
[2] Dates from Schanche 1994

A date of 1785±80 BP (T-9849) from Kalkillebukta 17 is unquestionably too late to represent the original occupation of the house, and dates instead from a secondary occupation. This later re-use is also indicated by a ceramic pot buried in an intrusive pit in the entrance passage. The vessel bears many similarities to Kjelmøy-type ceramics of the late Early Metal Period (Schanche 1994: 40-41, 96). All remaining radiocarbon dates from Kalkillebukta fall within the range of the other Gressbakken-type houses in Varanger.

Several undated house middens; Gressbakken 5, Høybukt 2 and Høybukt 4 are also included in the sample. Gressbakken 5 is included because of the large amount of excavated faunal material recovered there. The house depression is located on the same beach terrace as Gressbakken 3 and Gressbakken 4, though it is between one and two metres lower in elevation than the other two house features. Typologically, the artefacts from Gressbakken 5 closely resemble those from the two dated houses, and suggest that it was occupied at around the same time. Because of the paucity of radiocarbon dated Gressbakken-type houses in Sør-Varanger, two undated Gressbakken-type houses from Høybukt are also included in the sample. Given the limited chronological distribution of this house type in the Varanger region (Schanche 1994: 92-101), and the elevation of these house features above the modern seal level, they probably date within several centuries of 2000 BC.

Iversfjord is the only site outside Varangerfjord to produce both a large faunal sample and radiocarbon dates from the second half of YSA period three (Berntsen 1997; E. Helskog 1983). However, the Iversfjord faunal assemblage will not be analysed in any detail in this study. The house depressions from the site include a number of Gressbakken-type houses dated between 3730±90 BP (T-2772) and 3100±70 BP (T-2048) as well as several Early Metal Period house features ranging between 3050±90 BP (T-2351) and 2490±100 BP (E. Helskog 1983: 24-46, 53; Schanche 1994: 60-62). The midden from which the faunal remains were recovered produced much older dates ranging from 4240±100 BP (T-2881) to 3775±115 BP (T-12905) (Berntsen 1997: 55; E. Helskog 1983: 53) suggesting an extended period of use during the first half of YSA period III. The relationship, if any, between the house features and the midden is unclear. The midden may have been a communal waste disposal site shared by the entire community (Ericka Engelstad, pers. comm.). One of the main aims of this analysis is to

determine whether there was variation in faunal exploitation between households during the Gressbakken phase. The Iversfjord midden falls outside the realm of this study since it is, for the most part, older than the Gressbakken-type houses at the site, and probably represents the activities of multiple households.

4.3 Bergeby

The site of Bergeby, *Suovvejohka* in Saami, is located on the north shore of Varangerfjord in Nesseby kommune. Thirty Gressbakken-type house depressions have been registered immediately to the east of Bergeby River on a terrace fourteen to eighteen metres above modern sea level (Schanche 1994: 20, 255) (Figure 4.2). Some of these features have been partly destroyed by a modern road, and erosion along the river-edge may have obliterated others (Schanche 1994: 21). Excavations at the site were undertaken by Kjersti Schanche in 1991 (Schanche 1994: 20-31). A single house depression, number 18, was excavated in its entirety, along with over fifty percent of its midden (Figure 4.3). Test pits were also made in seven other house depressions, but none produced significant quantities of faunal remains.

4.3.1 Bergeby 18

A total area of 103 square metres was excavated in and around Bergeby 18 (Schanche 1994: 21-23). The house was excavated stratigraphically and all deposits were dry sieved through four millimetre mesh. All faunal material discovered in this way was collected according to level and 50 cm square. Three levels were identified in the area immediately surrounding the house depression (Figure 4.4). Level 1 consisted of compact reddish gravel and was approximately 10 cm thick. Level 2 was a mixture of organic soil, gravel and preserved bone and shell, and level 3 consisted of loose gravel with larger rocks, bone and shell. Levels 2 and 3 varied greatly in thickness, reaching a combined maximum of 80 cm where the cultural deposit was thickest.

Excavation revealed that the house floor, in particular the central hearth or hearths had been disturbed by recent agricultural activity. Midden material was largely concentrated on either side of the front (seaward) entrance passage, though occasional traces of poorly preserved bone and shell were also found in the mound behind the house (Schanche 1994: 22). Thirty-seven stone artefacts were recovered from the site, among

them ground slate points, slate abraders, bipolar cores of quartz and quartzite, and irregular slate cores. An additional 2150 stone flakes and 31 artefacts made using antler, bone and tooth were also found, as were three fragments of undecorated asbestos-tempered pottery (Schanche 1994: 26-28).

4.3.2 Fauna

The original analysis of faunal material from the site was undertaken by Anne Karin Hufthammer (n.d.). She found summer, winter and winter-spring indicators among the fish and migratory bird species of both middens at the site (Hufthammer n.d.: 5). She also noted significantly different proportions of fish, bird and mammal bones in the south-east and south-west middens, and a marked difference in the relative importance of cod and saithe between levels 2 and 3 of both middens (Hufthammer n.d.: 9-12). Hufthammer's identifications for the fish and birds are used here, but the mammalian values result from a re-analysis of the mammalian fauna. The author was deliberately conservative in making species-level identifications, and the values presented for the mammalian taxa in Tables 4.2-4.4 are generally lower than Hufthammer's original figures. However, this does not alter the relative importance of mammalian taxa from Hufthammer's original analysis, except that an additional seal species was recognised. Six ringed seal (*Phoca hispida*) specimens were identified, which Hufthammer had attributed to either the general seal category (Phocidae) or to harp seal (*Phoca groenlandica*). Table 4.2 presents the faunal material from each level in the south-east midden, table 4.3 does the same for the south-west midden, and Table 4.4 lists the combined values from both middens. Overall, preservation in both middens was good, and the percentage of identified specimens relative to the total number of recovered specimens was between 41% and 44% in all levels of each midden. The only exception to this was level 3 in the south-east midden, where identifiability was almost ten percent less at 33.1%.

There are several differences in the relative importance of various taxa between the different levels of the south-east midden. As Hufthammer (n.d.) notes, there is a higher percentage of saithe among the fish in level 3 than in either of the other two levels within the south-east midden (Figure 4.5). Among the birds, common eider are reasonably well represented in level 3, and are not found in the first two levels. The auk family is also far more important in level 3 than elsewhere. The relative importance of the mammalian

Table 4.2 Representation of vertebrate taxa at Bergeby 18, SE midden (all values are NISP)

LEVEL	1	2	3	TOTAL
FISH				
Anarhichas lupus wolffish			3	3
Labrus bergylta ballan wrass			4	4
Salmonidae: Salmon family			3	3
Mallotus mallotus capelin			1	1
Gadidae: Cod family	35	26	301	362
Gadus morhua cod	48	189	708	945
Melanogrammus aeglefinus haddock	17	41	291	349
Pollachius pollachius pollack			8	8
Pollachius virens saithe	11	4	333	348
Molva molva ling			32	32
Brosme brosme cusk		1	3	4
Pleuronectidae: Flatfish family		1	9	10
Pleuronectes platessa plaice		16	21	37
SUM ID'd FISH	**111**	**278**	**1717**	**2106**
BIRDS				
Sula bassana gannet			2	2
Anatidae: Ducks, geese & swans	1	2	2	5
Somateria mollissima common eider			10	10
Tetraonidae: Grouse family			1	1
Lagopus lagopus willow grouse	2			2
Lagopus mutus ptarmigan	2	3	1	6
L. lagopus/L. mutus			2	2
Tetrao urogallus capercaillie			2	2
Alcidae: Auks	2	4	36	42
Plautus alle little auk			1	1
Alca torda razorbill			3	3
Alca impennis great auk		2		2
Uria aalge guillemot			2	2
U. aalge/U. lomvia guillemot/Brunnich's guillemot			4	4
A. torda/U. lomvia razorbill/Brunnich's guillemot			9	9
Cepphus grylle black guillemot	1			1
Fratercula arctica puffin		5	10	15
Emberiza citrinella yellowhammer	1			1
SUM ID'd BIRD	**9**	**16**	**85**	**110**
MAMMALS				
Lepus timidus mountain hare	1		4	5
Rodentia: Rodent family		1	2	3
Lemmus lemmus lemming			17	17
Castor fiber beaver			1	1
Cetacea: Whale family		3	20	23
Phocaena phocaena porpoise	13	7		20
L. acutus/L. albirostris dolphin	1	7	4	12
Orcinus orca killer whale			1	1
Carnivora: Carnivores		1		1
Vulpes vulpes red fox			1	1
Mustelidae: Marten family			1	1
Lutra lutra river otter			1	1
Phocidae: Seal family	59	294	1061	1414
Large seal		1	6	7
Halichoerus grypus grey seal	1			1
Phoca groenlandica harp seal	7	26	107	140
Phoca hispida ringed seal	1	4	1	6
Artiodactyla: Artiodactyl family		2	9	11
Alces alces elk			3	3
Rangifer tarandus reindeer	9	15	55	89
SUM ID'd MAMMAL	**92**	**371**	**1294**	**1757**
Unidentifiable fragments	270	905	6266	7441

species is quite similar in all three levels, with seal taxa consistently dominant. There are, however, a few differences. Firstly, porpoise comprises a larger percentage of the mammal bone in level 1 than in levels 2 or 3. Secondly, seventeen fragments of lemming bone were identified from level 3, while none were identified in the other levels. Finally, ringed seal is a more important component of the seal assemblage in level 2 than in the other two levels. However, the small number of seal bones identified to species in levels 1 and 2 means that this observation carries little weight. Level 3 has a much wider variety of bird, fish and mammal taxa represented than either level 1 or level 2, a difference doubtless related to the size of each sample (see section 5.5)

Table 4.3 Representation of vertebrate taxa at Bergeby 18, SW midden (all values are NISP)

LEVEL	2	3	TOTAL
FISH			
Gadidae: Cod family	16	208	224
Gadus morhua cod	23	306	329
Melanogrammus aeglefinus haddock	25	136	161
Pollachius virens saithe	17	444	461
Molva molva ling	2	42	44
Brosme brosme cusk	1	2	3
Pleuronectidae: Flatfish family		2	2
Pleuronectes platessa plaice		10	10
SUM ID'd FISH	**84**	**1150**	**1234**
BIRDS			
Fulmarus glacialis fulmar	1		1
Sula bassana gannet		1	1
Anatidae: Ducks, geese & swans	7	6	13
Somateria mollissima common eider		15	15
S. mollissima/S. spectabilis common/king eider		3	3
Melanitta fusca velvet scoter	1		1
Mergus serrator red-breasted merganser		2	2
Mergus merganser goosander	1	1	2
Lagopus lagopus willow grouse	3	3	6
Lagopus mutus ptarmigan	3		3
L. lagopus/L. mutus		2	2
Laridae: Gulls		1	1
Alcidae: Auks	26	29	55
Plautus alle little auk	1	1	2
Alca torda razorbill		1	1
Alca impennis great auk	4	3	7
Uria aalge guillemot	3	11	14
U. aalge/U. lomvia guillemot/Brunnich's guillemot	1	18	19
A. torda/U. lomvia		1	1
Cepphus grylle black guillemot	1	1	2
Fratercula arctica puffin	2	5	7
Emberiza citrinella yellowhammer	1		1
SUM ID'd BIRD	**55**	**104**	**159**
MAMMALS			
Lepus timidus mountain hare		1	1
Rodentia: Rodent family	2		2
Lemmus lemmus lemming	2	35	37
Castor fiber beaver		5	5
Cetacea: Whale family	2	7	9
Small whale			1
Delphinapterus leucas beluga		2	2

Table 4.3 (continued)

LEVEL	2	3	TOTAL
MAMMALS (ctd.)			
Phocaena phocaena porpoise	1	3	4
Delphinidae: Dolphin family	3	1	4
L. acutus/L. albirostris dolphin	1	11	12
Orcinus orca killer whale		1	1
Carnivora: Carnivores		1	1
Canidae: Dog family	3	1	4
Canis familiaris dog		1	1
Vulpes vulpes red fox		1	1
Phocidae: Seal family	447	774	1221
Large seal	7	13	20
Halichoerus grypus grey seal		1	1
Phoca groenlandica harp seal	33	67	100
Phoca hispida ringed seal	21	4	25
Phoca vitulina harbour seal	1		1
P. hispida/P. vitulina	3	2	5
Artiodactyla: Artiodactyl family	7	7	14
Alces alces elk	1	1	2
Rangifer tarandus reindeer	20	126	146
Homo sapiens human	2		2
SUM ID'd MAMMAL	**556**	**1065**	**1622**
Unidentifiable fragments	980	2981	3961

Many of the general trends observed between the levels in the south-eastern midden are repeated in the south-western midden. No bone was recovered from level 1 in the south-western area, however, so it cannot be included in the comparison. Saithe are again a far more important component among the fish species in level 3, where they actually outnumber cod, than in level 2. The auk family is, however, more evenly represented in both levels than it is in the south-east midden. Among the mammalian taxa, seals are again dominant in both middens, and ringed seal is here far more important in level 2 than level 3. As in the north-east midden, lemmings form a much larger part of the assemblage in level 3 than in level 2. Reindeer are here far better represented in level 3 than in level 2, which was not the case in the other midden.

Table 4.4 Representation of vertebrate taxa at Bergeby 18, middens combined (all values NISP)

LEVEL	1	2	3	TOTAL
FISH				
Anarhichas lupus wolffish			3	3
Labrus bergylta ballan wrass			4	4
Salmonidae: Salmon family			3	3
Mallotus mallotus capelin			1	1
Gadidae: Cod family	35	42	509	586
Gadus morhua cod	48	212	1014	1274
Melanogrammus aeglefinus haddock	17	66	427	510
Pollachius pollachius pollack			8	8
Pollachius virens saithe	11	21	777	809
Molva molva ling		2	74	76
Brosme brosme cusk		2	5	7

Table 4.4 (continued)

LEVEL	1	2	3	TOTAL
FISH (ctd.)				
Pleuronectidae: Flatfish family		1	11	12
Pleuronectes platessa plaice		16	31	47
SUM ID'd FISH	**111**	**362**	**2867**	**3340**
BIRDS				
Fulmarus glacialis fulmar		1		1
Sula bassana gannet			3	3
Anatidae: Ducks, geese & swans	1	9	8	18
Somateria mollissima common eider			25	25
S. mollissima/S. spectabilis common/king eider			3	3
Melanitta fusca velvet scoter		1		1
Mergus serrator red-breasted merganser			2	2
Mergus merganser goosander		1	1	2
Tetraonidae: Grouse family			1	1
Lagopus lagopus willow grouse	2	3	3	8
Lagopus mutus ptarmigan	2	6	1	9
L. lagopus/L. mutus			4	4
Tetrao urogallus capercaillie			2	2
Laridae: Gulls			1	1
Alcidae: Auks	2	30	65	97
Plautus alle little auk		1	2	3
Alca torda razorbill			4	4
Alca impennis great auk		6	3	9
Uria aalge guillemot		3	13	16
U. aalge/U. lomvia guillemot/Brunnich's guillemot		1	22	23
A. torda/U. lomvia			10	10
Cepphus grylle black guillemot	1	1	1	3
Fratercula arctica puffin		7	15	22
Emberiza citrinella yellowhammer	1	1		2
SUM ID'd BIRD	**9**	**71**	**189**	**269**
MAMMALS				
Lepus timidus mountain hare	1		5	6
Rodentia: Rodent family		3	2	5
Lemmus lemmus lemming		2	52	54
Castor fiber beaver			6	6
Cetacea: Whale family		5	27	32
Delphinapterus leucas beluga			2	2
Phocaena phocaena porpoise	13	8	3	24
Delphinidae: Dolphin family		3	1	4
L. acutus/L. albirostris dolphin	1	8	15	24
Orcinus orca killer whale			2	2
Carnivora: Carnivores		1	1	2
Canidae: Dog family		3	1	4
Canis familiaris dog			1	1
Vulpes vulpes red fox			2	2
Mustelidae: Marten family			1	1
Lutra lutra river otter			1	1
Phocidae: Seal family	59	541	1835	2635
Large seal		8	19	27
Halichoerus grypus grey seal	1		1	2
Phoca groenlandica harp seal	7	59	174	241
Phoca hispida ringed seal	1	25	5	31
Phoca vitulina harbour seal		1		1
P. hispida/P. vitulina		3	2	5
Artiodactyla: Artiodactyl family		9	16	25
Alces alces elk		1	4	5
Rangifer tarandus reindeer	9	45	181	235
Homo sapiens human		2		2
SUM ID'd MAMMAL	**92**	**927**	**2359**	**3379**
Unidentifiable fragments	268	1885	9247	11400

In combining the data from both middens, little information is lost in terms of the relative importance of various taxa. The poorer representation of auks in level 2 than level 3 of the north-east midden becomes less pronounced with the addition of the material from the north-western midden. The difference between the two middens in terms of the importance of reindeer in level 3 is also blurred when the two samples are combined.

More important information is lost, however, if the data from all levels are combined. This applies particularly to the fish taxa. If the overall totals are used, saithe ranks second among the fish species, after cod and before haddock. Its very minor contribution in levels 1 and 2 is "drowned out" by its importance in the much larger sample from level 3. In fact, its large sample size means that all general trends observed in level three are mirrored in the overall totals. This applies to the importance of both common eider and lemming, both of which are far better represented in level 3 than in the other two levels. However, these taxa are of minor importance within the greater faunal assemblage, whether or not it is subdivided.

The importance of saithe in level 3 at Bergeby 18 is unusual among the inner-fjord sites, where cod tends to be heavily dominant (Figure 4.6). At other sites in the inner-fjord saithe makes up less than 10% of the top three fish taxa, while in level 3 at Bergeby 18 it accounts for almost 30%. This suggests that the summer saithe fishery was more important here than at other houses in the area. Saithe was also more important during the initial occupation of Bergeby 18 than in subsequent years at the same house (Figures 4.5 and 4.6). Perhaps the house was initially occupied year-round and was later abandoned during the summer months. Unfortunately, there are currently no other excavated houses at the site to test whether similar changes through time occur elsewhere on the site.

Thus, if stratigraphic and horizontal spatial differences at Bergeby 18 are ignored, many of the general trends among the faunal data remain intact. However, an important piece of information is lost with regard to the fish taxa, which may relate to a seasonal or functional change in the use of the house over time. Bergeby was excavated in a way which permits the separation of spatial and stratigraphic units. However, at other sites such as Gressbakken the faunal remains from all strata were lumped together. In such cases, it must be recognised that we are dealing with an "average" of behaviour at the

site, and that variation over time may be reduced to the dominant trend. At Bergeby 18, this dominant trend was determined by the deepest, thickest, midden layer where bone preservation was at its best. Smaller faunal samples were recovered from the other cultural levels. It is interesting to note that a thick, black midden layer which rests directly above the natural substrate and contains well preserved organic remains is a nearly universal feature of the seaward mounds of excavated Gressbakken-type houses.

4.4 Karlebotnbakken

During the construction of a modern building in the village of Karlebotn (*Stuorravuonna* in Saami), Nesseby kommune in 1984, two previously recognised Gressbakken-type house features were damaged. No overall plan of the site was drawn before the destruction took place. One of the house features was completely destroyed while the other, Karlebotn 1, remained partly intact and was subsequently excavated. Kjersti Schanche directed the rescue excavation in 1985 and 1986 under the auspices of the Tromsø Museum (Schanche 1986, 1989a, 1994: 44-45). Because Karlebotn 1 is situated on a property known as "Karlebotnbakken", the site is also referred to as Karlebotnbakken in the literature. The two names are used interchangeably throughout this thesis.

A total of 76 square metres were excavated at Karlebotnbakken, encompassing the western portion of the house depression (its eastern end had been destroyed by building activity), a small area north of the house, and part of the south-western midden (Figure 4.7). The midden mound to the south-east of the entrance passage was almost completely removed by the bulldozers, and much of the south-west midden had been subject to recent disturbance and was therefore not excavated. There are three radiocarbon dates from the site: 3390±110 BP (T-7743), 3640±140 BP (T-7744) and 4480±90 BP (T-7742), the last of which may pre-date its occupation (see section 4.2). The cultural deposit reached a maximum of 70 cm in the mound south of the house depression, and was filled throughout with large numbers of cooking stones. Midden material, with a high concentration of bone, shell and cooking stones was restricted to the south side of the house which faced the sea.

Excavation proceeded in arbitrary ten centimetre levels which stopped at the beginning of each new stratigraphic level. The faunal remains were recovered from an excavated

midden area of approximately five square metres, which comprised roughly five percent of the total midden area (Schanche 1989a: 64). All midden material was sieved through four millimetre mesh. Five levels were defined during excavation of the midden area (Schanche 1986) (Figure 4.8). Level 1 was a clearance level following removal of the turf. Level 2 was ten centimetres thick and consisted of brownish stony gravel. It contained a high concentration of cooking stones and larger stones. This arbitrary level corresponded well with the stratigraphic level resting on top of midden material. Level 3 was another ten centimetre thick arbitrary level which consisted of a dark, rich midden deposit containing bone and shell. Level 4 was also a ten centimetre thick midden layer with particularly large amounts of well-preserved bone and shell. Level 5 was a final arbitrary layer of midden which rested on top of sterile sandy gravel.

The excavations at Karlebotnbakken produced a rich artefact assemblage (Schanche 1989: 56-64, 1994: 44-45). The lithics were dominated by large numbers of quartz and quartzite scrapers, as well as slate points and slate knives. Quartz and quartzite cores were also common. Organic preservation in the midden was excellent, and bone and antler points, fish hooks, harpoons and needles were recovered along with 24 tooth beads. Six fragments of comb ceramic were also recovered.

Such finds are typical of the Gressbakken phase assemblages throughout the fjord, yet a number of unusual artefacts also came to light. Two small carved human figurines of antler were found (Figure 4.9), which have only one known parallel from Advik. In addition, a copper dagger was found 20 cm below the surface in an undisturbed part of the midden. If it is contemporary with the surrounding deposit (as it appears to be), it is one of the earliest known metal artefacts from northern Norway (B. Olsen 1994: 91). Copper is not available locally in Finnmark, and Schanche suggests a possible source in the Russian region of Karelia, which lies to the south-east of Varanger and borders Finland: "One possibility is that the copper has its origin in Russian Karelia, where there are indications of copper extraction and working as early as 3000 BC" (Schanche 1994: 194—my translation).

4.4.1 Fauna

Faunal material from Karlebotnbakken was originally identified by Pirjo Lahtiperä of the Zoological Museum in Bergen. She identified both summer and winter migrants among

the bird species (Schanche 1994: 45, 151-152, 161), and cod was heavily dominant among the fish remains, suggesting a spring or winter-spring fishery. The current study involved a re-analysis of the mammal remains from the site. The author was able to place a considerable number of the bones identified by Lahtiperä to the broad level of "mammal" into more specific taxonomic categories. Three new categories of seal were identified: ringed seal (*Phoca hispida*), harbour seal (*Phoca vitulina*) and ringed seal/harbour seal. Moreover, 32 of the 35 bones originally identified as grey seal (*Halichoerus grypus*) actually belonged to other seal taxa (usually harp seal, *Phoca groenlandica*). The NISP counts for mammals presented in Table 4.5 thus differ somewhat from those in Lahtiperä's report (presented in Schanche 1994: 45), but the rank order of the mammalian taxa remains essentially unchanged. The relative importance of different fish taxa is remarkably consistent across all five levels at the site, and the same holds true for bird and mammalian taxa as well. This is not surprising since levels 3, 4 and 5 are arbitrary levels within the same midden deposit. The only obvious difference between the levels is the strong dominance of reindeer over seal bone in levels one and two, while the two taxa are more evenly represented in levels 3, 4, and 5. This could indicate a change in site seasonality. Alternatively, it may suggest a shift to a more inland orientation in the final stages of occupation at the site. While the very small amounts of recovered fish bone in the upper two levels appear to support the second idea, they may also relate to preservation conditions in the upper strata. Preservation at Karlebotnbakken was good, as indicated by a total of 5864 identifiable fragments out of 14379 excavated fragments, or 40.8% identifiability. This breaks down in the following way: level one 53.3%, level two 41.1%, level three 36.4%, level four 43.1% and level five 54.4%.

The importance of reindeer bone at Karlebotnbakken far outstrips that at any other contemporary site in the region. This may relate to its location directly on the main reindeer migration route between summer and winter pastures (see Figure 2.8). Assuming that the wild reindeer population of Varanger shared the migration patterns of today's domestic population, large numbers of reindeer would have been found between the head of Varangerfjord and the Pasvik River each spring and autumn. Karlebotn is situated in this corridor and the occupants of the site probably had reindeer herds quite literally on their doorstep during the migrations. The other study sites are located further

out along the coast of Varangerfjord and their inhabitants likely had to travel greater distances to hunt reindeer.

Table 4.5 Representation of vertebrate taxa at Karlebotn 1 (all values are NISP)

LEVEL	1	2	3	4	5	TOTAL
FISH						
Clupea harengus herring				1		1
Gadus morhua cod	11	13	1168	944	324	2460
Melanogrammus aeglefinus haddock			270	125	38	433
Pollachius virens saithe			12	49	3	64
Molva molva ling					1	1
Brosme brosme cusk				21		21
Pleuronectidae: Flatfish family			9	5		14
SUM ID'd FISH	**11**	**13**	**1459**	**1145**	**366**	**2994**
BIRDS						
Fulmarus glacialis fulmar			8	6		14
Anas crecca teal				1		1
Anas penelope wigeon			1			1
Somateria mollissima common eider			7	5		12
Lagopus lagopus willow grouse	2		6	6		14
Laridae: Gulls			7			7
Alcidae: Auks			4	9		13
Alca impennis great auk			8	15	3	26
Uria aalge guillemot			52	108	23	183
Uria lomvia Brunnich's guillemot			11	34	33	78
Fratercula arctica puffin	1		46	3	3	53
Passeriforme: perching birds			1			1
SUM ID'd BIRD	**3**	**0**	**151**	**187**	**62**	**403**
MAMMALS						
Lepus timidus mountain hare			9	5	2	16
Rodentia: Rodent family			2	2	5	9
Castor fiber beaver	3			10		13
Cetacea: Whale family		1	6	9	15	31
Medium whale			1			1
Large whale		1	1			2
Phocaena phocaena porpoise			5	6		11
L. acutus/L. albirostris dolphin				2	1	3
Canidae: Dog family	3			3		6
Ursus arctos brown bear				1		1
Phocidae: Seal family	12	21	431	415	154	1033
Large seal			16	6	5	27
Halichoerus grypus grey seal			3			3
Phoca groenlandica harp seal		4	51	43	27	125
Phoca hispida ringed seal			4	3	1	8
Phoca vitulina harbour seal				1	1	2
P. hispida/P. vitulina	1		2	1		4
Artiodactyla: Artiodactyl family			1			1
Alces alces elk			2			2
Rangifer tarandus reindeer	138	58	430	410	133	1169
SUM ID'd MAMMAL	**157**	**85**	**964**	**917**	**344**	**2467**
unidentifiable fragments	150	138	4489	3093	645	8515

4.5 Advik

The site which Simonsen (1961) refers to as "Advik" is more correctly known by the Saami name of *Báŋkgohppi*. The Norwegian name "Advik" actually refers to a neighbouring cove and was applied to the archaeological site as the result of a misunderstanding (Schanche 1994: 46). However, because the name appears on all of Simonsen's excavation plans and has been used in the literature for many years, "Advik" is used in this thesis in order to avoid any further confusion. The archaeological site of Advik is located in Nesseby kommune in a small valley on the south side of Veinesbotn, a large bay in the inner part of Varangerfjord. Simonsen (1961: 214) mapped a total of 20 house depressions at the site, ranging in elevation from 13 to 21 m above modern sea level (Figure 4.10). He divided the site into two main phases of occupation, an earlier phase indicated by the Karlebotn-type house depressions at higher elevations (Houses A, D-H), and a later occupation indicated by Gressbakken-type houses at lower elevations (Houses B, C, I-T). In 1954, Simonsen excavated the interior of two of the Karlebotn-type houses: A and F, along with two midden features associated with House F. Among the Gressbakken-type houses, he excavated the interior of House B and House J, along with an isolated midden feature south-east of House I.

4.5.1 Advik B

At Advik B, Simonsen excavated the interior of the house depression and dug several test pits external to the house (Simonsen 1961: 228-232). Little of the mound/midden area surrounding the house depression was excavated, but midden material was found in and around the front entrance passage. Marine shell from the midden was radiocarbon dated to 3630±80 BP (T-2058B) (Helskog 1978). Simonsen's excavation plan (Figure 4.11) shows a two square metre area encompassing the front entrance passage and the area immediately to its west, and it is from here that the faunal remains derive. All observed faunal material was hand collected but was not sieved (Povl Simonsen, pers. comm. 1998), which may account for the very low numbers of fish bones relative to mammal bones at the site.

The cultural layer within the house was relatively thin, averaging approximately 10 cm thick, and contained relatively few artefacts (Simonsen 1961: 231-232). Lithic artefacts included 2 abraders, 2 scrapers, 4 cores, and 423 flakes. Bone and antler artefacts

included a single bone point, a fragment of an antler harpoon or leister, an antler barb, a bone needle and several unidentifiable worked fragments.

4.5.2 Advik J

House J was excavated in a similar fashion to House B (Simonsen 1961: 233-242). The interior of the house depression was completely excavated (Figure 4.12), and samples of the banks to the front and rear of the house were removed so that the entire section was exposed (Figure 4.13). Unfortunately, Simonsen does not show the size of the excavated bank area on his plan. Two distinct cultural layers were revealed in the house interior and the mound in front of the house, separated by a 6-10 cm thick layer of sterile sand. Similar artefacts were recovered from both layers, and Simonsen (1961: 138) concluded that the deposits represented two occupations of the house separated by a relatively short period of abandonment. A charcoal sample from an unspecified context in the interior of House J was radiocarbon dated to 3750±150 BP (T-233) (Helskog 1980). Stone artefacts were rare in both cultural deposits, with a combined total of three ground slate points, two ground slate knives, and 98 flakes. A total of 25 pieces of worked bone and antler were recovered from both culture-layers, including four points, three needles, two fish hooks and two barbs. Along with the classic Gressbakken-type double hearth, a child burial was found in the interior of the house. It had been placed in a small pit associated with a post hole in the south-west corner.

As at House B, faunal remains were collected by hand and none of the deposits were sieved. While the faunal remains from each of the four sampled bank areas were kept separate: the north-east and north-west middens on either side of the front entrance passage, and the areas to the south-east and south-west behind the house, the bones from the two distinct cultural layers were collected as a single unit in each area. Simonsen (1961: 236) mentions a circular feature at the rear of the house in the south-eastern quadrant. He describes it as a single layer of fire-cracked rock and ash roughly 1.2 m in diameter. Underneath it lay "a large number of fragments of whale bone, which together comprised four ribs, and underneath them a thin, black culture-layer before one reached sterile ground" (Simonsen 1961: 263, my translation). These ribs, probably the 22 fragments of whale bone documented for the south-east quadrant, may well have been a structural part of the feature rather than food refuse.

4.5.3 Fauna

The original analysis of all faunal material from Advik was carried out by Håkon Olsen. The fish and bird material along with Olsen's interpretation of site seasonality were published in his 1967 volume *Varanger-Funnene IV*. There, he treated the faunal material from all of the excavated houses and middens at the site as a single sample. Renouf (1981, 1989) was the first to separate the faunal material from each of the excavated houses before analysis. There is little identified fish at either house, but the birds offer some insight into seasonality. At House J, guillemots and puffins are spring-summer migrants, and little auk bones indicate winter activity (Renouf 1989: 186-187). House B also has the same spring-summer birds, and the large number of harp seal bones further suggests spring hunting (Renouf 1989: 184-185).

Table 4.6 Representation of vertebrate taxa at Advik B (all values are NISP)

	NW midden
FISH	
Gadus morhua cod	53
Melanogrammus aeglefinus haddock	3
Pollachius virens saithe	4
Molva molva ling	4
SUM ID'd FISH	**64**
BIRDS	
Somateria mollissima common eider	2
Melanitta fusca velvet scoter	3
Lagopus lagopus willow grouse	4
Uria aalge guillemot	57
U. aalge/U. lomvia guillemot/Brunnich's guillemot	4
Fratercula arctica puffin	1
SUM ID'd BIRD	**71**
MAMMALS	
Lepus timidus mountain hare	2
Castor fiber beaver	1
Cetacea: Whale family	1
Small whale	3
Canis familiaris dog	7
Vulpes vulpes red fox	2
Phocidae: Seal family	286
Large seal	19
Erignathus barbatus bearded seal	1
Phoca groenlandica harp seal	45
Phoca hispida ringed seal	11
P. hispida/P. vitulina	4
Rangifer tarandus reindeer	4
SUM ID'd MAMMAL	**386**
Unidentifiable fragments	277

Håkon Olsen's NISP values for fish and bird, taken from his original notes at the Zoological Museum in Bergen, are presented in Table 4.6 for Advik B and Table 4.7 for Advik J. The mammal bone was re-analysed as part of this project, and the mammalian NISPs in the tables are based on the new identifications, which agree in most cases with Olsen's. This author tended to be more conservative in assigning seal bones to the species level than Olsen; the phocid category presented here is larger than his, while the NISP totals for individual seal species are smaller.

Table 4.7 Representation of vertebrate taxa at Advik J (all values are NISP)

	NE midden	NW midden	SE	SW	TOTAL
FISH					
Gadus morhua cod	15	5			20
Melanogrammus aeglefinus haddock	8	1			9
Pollachius virens saithe	14	10			24
SUM ID'd FISH	**37**	**16**	**0**	**0**	**53**
BIRDS					
Somateria mollissima common eider	8				8
Lagopus lagopus willow grouse	1	1			2
Plautus alle little auk	2				2
Alca impennis great auk			1		1
Uria aalge guillemot	14	7	1	3	25
Uria lomvia Brunnich's guillemot		4			4
Fratercula arctica puffin	2		1		3
SUM ID'd BIRD	**27**	**12**	**3**	**3**	**45**
MAMMALS					
Cetacea: Whale family	6	8	22*		36
L. acutus/L. albirostris dolphin		2			2
Phocaena phocaena porpoise		1			1
Vulpes vulpes red fox	3	1			4
Phocidae: Seal family		20	5	2	27
Erignathus barbatus bearded seal		1			1
Phoca groenlandica harp seal	2	1			3
Phoca hispida ringed seal	11	1			12
P. hispida/P. vitulina			1		1
Rangifer tarandus reindeer	10	14	1	2	27
SUM ID'd MAMMAL	**32**	**49**	**29**	**4**	**114**
Unidentifiable fragments	304	99	23	12	438

*These whale bones are probably a structural part of a feature—see section 4.5.2

The faunal assemblages from both houses are relatively small. That from House B is heavily dominated by seal bones. At House J, there is a much more even distribution between fish, mammals and birds in both the north-east and north-west middens. As discussed above, the whale bones in the south-east quadrant probably lined the bottom of a feature. The number of bones indicative of diet in both the south-east and south-west quadrants is therefore extremely small and will not be discussed further. A comparison of the material from the two middens indicates that saithe forms a larger part of the fish

remains in the north-west than the north-east midden. The difference is probably not be significant, however, due to the small sample size. Among the mammals, ringed seal is far better represented in the north-east midden. However, the relatively large number of unidentified seal bones in the north-west midden may well be ringed seal. When the middens are treated separately, the faunal samples are very small. At the risk of losing information on variation between the middens, they will be combined to produce a more robust sample in future discussion.

4.6 Gressbakken Nedre Vest

The site of Gressbakken is located roughly 2.5 km east of Advik in Nesseby kommune, immediately west of the Nyelv River. It is from here that both the late YSA house-type and the final phase of YSA period III take their names. There is evidence of human occupation at the site over a long time span. On a high terrace 27 m above the present sea level, Simonsen (1961: 265) located a number of open sites from YSA period I. Much lower down, at an elevation of 3-8 m a.s.l. there are a number of Saami house depressions from the sixteenth and seventeenth centuries (Simonsen 1961: 271). As for late Younger Stone Age settlement at this locality, there are two clusters of Gressbakken-type houses situated about 250 m apart. Two house features, 16 and 17, lie between them (Simonsen 1961: 378). Renouf (1989: 188) suggests that modern activity has destroyed evidence of intervening structures which may once have linked the two areas.

Gressbakken Nedre Vest, *Risebávti* in Saami, is the more westerly of the two groups of Gressbakken-type houses (Figure 4.14). Simonsen excavated here in 1956 and 1957, conducting his largest scale investigations at a late YSA settlement (Simonsen 1961: 271-377). He concentrated particularly on the midden features at the site, completely excavating the midden deposits associated with houses 3 and 4, and taking large samples from the middens at other houses. He also excavated, for the first time, an area between two house features. Håkon Olsen (1967, n.d.) identified the faunal material from Simonsen's excavations at the site. As at Advik, the fish and bird remains were published in *Varanger-Funnene IV* (H. Olsen 1967), and the mammal bones were presented in an unpublished manuscript (H. Olsen n.d.). A detailed study of seasonality at the site was also undertaken by Renouf (1981, 1989) based upon H. Olsen's original notes in the Zoological Museum, Bergen. Bone preservation across the site was good,

as indicated by the condition of the bone surfaces. In many cases, seal bone was still greasy, and the majority of bone scored lower than two according to Behrensmeyer's (1978) weathering stages[1]. The ratio of identifiable to unidentifiable fragments does not provide a useful measure of preservation in this case, as none of the deposits were sieved, and a large number of the unidentifiable fragments may not have been recovered initially or stored in the Zoological Museum after the identifications were complete.

4.6.1 Gressbakken 3

At Gressbakken 3, the house depression itself and the two large mounds directly in front of it were completely excavated in 1956 and 1957 (Figure 4.15) (Simonsen 1961: 288-316). Several distinct layers were discerned within the mounds after the peat was removed (Figure 4.16). The uppermost layer consisted of approximately three centimetres of grey sand. Below this was a five centimetre thick rocky layer, followed by 50-60 cm of dark midden material filled with stones and extremely large quantities of shell and bone. All of these were cultural levels containing artefacts. Underneath these cultural strata was a thin layer of pebbles resting on natural gravel. There are two radiocarbon dates from this house, one of 3650±150 BP (T-198) on a charcoal sample from the house floor, and another of 4180±90 BP (T-1917) on marine shell from the midden (Helskog 1978). As discussed in section 4.2, Kjersti Schanche has argued that the latter figure pre-dates the occupation of the house (Schanche 1994: 98-99).

Simonsen recovered numerous artefacts at House 3, including stone scrapers, abraders, cores, fish hooks and ground slate points, along with large numbers of flakes. The collection of bone and antler artefacts was also particularly rich and in some cases highly decorated. It consisted, among other things, of barbs, fish hooks, harpoons, leister prongs, chisels, points, needles, beads, and combs. All bone encountered in the midden deposits to the north-east and north-west of the house (i.e. on either side of the front entrance passage) was hand collected.

[1] Behrensmeyer's (1978) weathering stages for large mammal bone are as follows: 0) bone is greasy with no cracking or flaking, 1) cracking begins parallel to fiber structure, 2) flaking of outer surface, cracks are present and have angular edges, 3) bone surface has a rough fibrous texture, weathering penetrates 1-1.5 mm and crack edges are rounded, 4) surface texture is rough and coarsely fibrous, splinters of bone are loose on surface, weathering penetrates inner cavities and cracks are open, 5) bone material extremely fragile and falling apart in situ, large splinters present.

Faced with huge quantities of bone from Simonsen's excavations at Gressbakken, Håkon Olsen identified only samples of the material from Gressbakken 3. He identified 60% of the fish remains in the north-east midden, and just under 80% in the north-west midden (Olsen 1967). Even these partial samples are large, and will be used in this analysis (Table 4.8). Cod is strongly dominant among the fish material, suggesting emphasis on the spring cod fishery, or perhaps on the ever-present fjord cod.

Olsen did not identify any of the bird bone at House 3 to more a more specific level, however this task was later undertaken by Pirjo Lahtiperä, whose identifications were published in Renouf's discussion of seasonality at the house (Renouf 1989: 200-203). The bird values presented in Table 4.8 are from Lahtiperä's original notes at the Zoological Museum in Bergen. The species represented in the bird material indicate spring-summer and autumn-winter activity at the site (Renouf 1989: 200-202). Spring-summer migrants include the guillemot and several duck species, while little auk and Brunnich's guillemot are autumn-winter visitors. The large number of grouse bones in the north-east midden further suggest autumn-winter trapping (Renouf 1989: 202).

Among the mammal bone at the site, Olsen fully identified the land mammals, dividing the sea mammal bone only into seal and whale categories. The author identified, for the first time, all of the seal bone from the site. However, due to time constraints and logistical difficulties in removing the whale bones storage, they remain unidentified. Olsen's notes record a total of 4061 fragments of unidentified whale bone. During the re-analysis, several fragments of dolphin and porpoise were identified among the other mammal bones. These are indicated in Table 4.8 along with NISP values based on the author's examination of the seal and terrestrial mammal bone from the site. The fish and bird values presented in the table are from H. Olsen's unpublished notes in the Zoological Museum, Bergen.

Table 4.8 Representation of vertebrate taxa at Gressbakken 3 (all values are NISP)

	NE midden	NW midden	TOTAL
FISH			
Cottus scorpius sea scorpion	2		2
Anarhichas lupus wolffish	4	2	6
Gadus morhua cod	6290	5224	11514
Melanogrammus aeglefinus haddock	562	466	1028
Pollachius virens saithe	616	484	1100
Molva molva ling	54	94	148
Brosme brosme cusk	28	33	61

Table 4.8 (continued)

FISH (ctd.)			
Pleuronectidae: Flatfish family	8	10	18
SUM ID'd FISH	**7564**	**6313**	**13877**
unidentified fish	12650	8012	20662
BIRDS			
Fulmarus glacialis fulmar	18	10	28
Anser brachyrhynchus pink-footed goose	1		1
Somateria mollissima common eider	14	21	35
Melanitta nigra common scoter		3	3
Melanitta fusca velvet scoter	1	3	4
Bucephala clangula goldeneye		1	1
Clangula hyemalis long-tailed duck	1		1
Mergus serrator red-breasted merganser		2	2
Mergus merganser goosander	1		1
Lagopus lagopus willow grouse	69	65	134
Larus fuscus lesser black-backed gull	4	4	8
Larus marinus greater black-backed gull	8	8	16
Larus canus common gull	6	1	7
Rissa tridactyla kittiwake	6	6	12
Plautus alle little auk	33	26	59
Alca impennis great auk		2	2
U. aalge/U. lomvia guillemot/Brunnich's guillemot	904	1108	2012
Cepphus grylle black guillemot	9	3	12
Fratercula arctica puffin	34	36	70
SUM ID'd BIRD	**1109**	**1299**	**2408**
MAMMALS			
Castor fiber beaver	18	26	44
Cetacea: Whale family	*	*	*
Lagenorhynchus albirostris white nosed dolphin	1	2	3
L. acutus/L. albirostris dolphin	8	7	15
Phocaena phocaena porpoise	3		3
Canidae: Dog family	1	3	4
Canis familiaris dog	4	14	18
Vulpes vulpes red fox	20	12	32
Alopex lagopus Arctic fox	2		2
Ursus arctos brown bear		2	2
Mustela erminea stoat	1		1
Martes martes pine marten	8	11	19
Gulo gulo wolverine		1	1
Lutra lutra river otter		2	2
Phocidae: Seal family	1706	2994	4700
Large seal	27	89	116
Erignathus barbatus bearded seal	17	31	48
Halichoerus grypus grey seal		15	15
Phoca groenlandica harp seal	109	263	372
Phoca hispida ringed seal	52	81	133
Phoca vitulina harbour seal	5	11	16
P. hispida/P. vitulina	48	142	190
Rangifer tarandus reindeer	168	279	447
SUM ID'd MAMMAL	**2198**	**3985**	**6183**
Unidentifiable fragments	15982	6946	22928

* The whale bones are not identified beyond the general "Cetacea" category. Olsen's notes on file in the Zoological Museum, Bergen document 4061 fragments of unidentified whale bone.

There is very little difference between the north-east and north-west midden areas at Gressbakken 3 in terms of the relative importance of taxa. Cod far outnumbers all other fish taxa, with haddock and saithe present in roughly equal numbers in the north-east and the north-west middens. Birds are similarly represented in the two areas, with guillemots and Brunnich's guillemots strongly dominant. The relative importance of mammals is also very similar in both midden areas. Small numbers of a few mammalian taxa are present in only one of the middens, but such differences are hardly significant. The most important differences between the middens relate to the overall importance of fish and mammals. There are over 40% more fish bones in the north-east than the north-west midden, and almost twice as many identified mammal bones in the north-west than the north-east midden. The number of identified bird bones is roughly equal in both middens. While the differences between the two middens may reflect differential deposition, they could also be a product of differential recovery since the material from these deposits was not sieved (see section 5.4).

4.6.2 Gressbakken 4

At House 4, as at House 3, Simonsen excavated not only the house depression, but the entire mound area in front of the house (Figure 4.17) (Simonsen 1961: 316-343). He also investigated an area between Houses 3 and 4, and exposed a rectangular double hearth feature directly to the south-east of House 4 (Simonsen 1961: 343-346). This feature had a pile of cooking stones at its centre, and was apparently an outdoor version of the hearth formation common to most Gressbakken-type houses. The interior of House 4 was somewhat unusual in that it had only a single hearth, rather than a double one. This hearth was rectangular, and situated on the east side of the house depression along its long-axis. In the mound on the north (seaward) side of the house, the stratigraphic sequence was as follows: immediately underneath the turf was a five centimetre thick layer of grey sand resting on top of a stony layer approximately three centimetres thick. Below this was approximately 14 cm of sandy stone-filled deposit which blended into a midden layer between 80 and 135 cm thick. This midden layer, a composite of black organic soil and shell containing well-preserved faunal remains, was interrupted by numerous thin and more substantial bands of sand, which Simonsen (1961: 317) interprets as the result of storm flooding. Sterile gravel lay below the midden (Figure 4.18).

There is a single radiocarbon date of 3850±100 BP (T-234) from House 4, taken on a charcoal sample from the midden (Helskog 1978). The northern mound at the house produced an extremely large number of artefacts (Simonsen 1961: 322-342). These included large numbers of quartzite and slate flakes, ground slate points, and single-edged ground slate knives. Miniature versions of these knives were also found. Bone and antler artefacts were particularly numerous at this house, notably bone points, antler barbs and fish hooks, bird bone needles, large bone daggers, bone and antler harpoons, and antler combs. As at Gressbakken 3, many of the bone and antler artefacts were decorated with complex patterns of zigzag lines (Figure 4.19). Large amounts of unworked fish, bird and mammal were recovered by hand from the midden deposits to the north-east and north-west of the house depression. Small bone samples were also recovered to the east and south-east of the house, but a more precise context was unfortunately not recorded.

Olsen (1967, n.d.) identified all of the faunal material from Gressbakken 4. The large amounts of identified bone from the site formed the cornerstone of his analysis of the fish and bird material (Olsen 1967). Table 4.9 presents the NISP values for fish in all excavated areas of the house feature based on Olsen's original notes. The bird NISPs for the north-eastern midden are based on this author's re-analysis of the material, and agree in large part with those in Olsen's notes. For the north-west midden and the east and south-east areas, the bird figures are taken from Olsen's identifications on file in the Zoological Museum, Bergen. As at the other houses at Gressbakken, the author re-examined the mammal bone from House 4. A considerable number of the seal bones were reassigned to different categories. However, the only marked changes in the overall importance of each taxon were an increase in the number of identified ringed seal specimens, and the introduction of a ringed seal/harbour seal category. Another change was the breakdown of the "Cetacea" category into size classes where a more precise identification was not possible.

Renouf (1989: 190-199) suggests year-round occupation at Gressbakken 4, based on the relative percentages of fish species in both middens and the presence of both spring-summer and autumn-winter migrants among the bird species. The large amounts of harp seal indicate spring activity at the site and the presence of grouse and a wide variety of small mammals probably suggests winter trapping (ibid). Here, as at so many of the

other Varanger houses, Renouf can demonstrate the potential for year round occupation at the site, but summer abandonment is also a possibility, as is a shorter occupation from late winter to early summer.

Table 4.9 Representation of vertebrate taxa at Gressbakken House 4 (all values are NISP)

	NE midden	NW midden	E	SE	TOTAL
FISH					
Cottus scorpius sea scorpion		2			2
Gadus morhua cod	1047	754	33		1834
Melanogrammus aeglefinus haddock	208	125	9		342
Pollachius virens saithe	124	106	6		236
Molva molva ling	38	16	1		55
Pleuronectes platessa plaice		1			1
Hippoglossus hippoglossus halibut	2	1			3
SUM ID'd FISH	**1419**	**1005**	**49**	**0**	**2473**
unidentified fish	1508	1280	0	0	2788
BIRDS					
small bird	77				77
medium bird	75				75
Fulmarus glacialis fulmar	14	17			31
Cygnus cygnus whooper swan	2				2
Somateria mollissima common eider	41	21			62
Somateris spectabilis king eider	20	3			23
Melanitta fusca velvet scoter	1		1		2
Mergus merganser goosander	2				2
Lagopus lagopus willow grouse	203	84	2		289
Calidris maritima purple sandpiper	1				1
Philomachus pugnax ruff			1		1
Larus fuscus lesser black-backed gull		2			2
Larus argentatus herring gull		1			1
Larus marinus black-backed gull	36	23			59
Larus canus common gull		1			1
Rissa tridactylla kittiwake	2				2
Plautus alle little auk	25	6			31
Alca torda razorbill	7	6			13
Alca impennis great auk	10	3			13
Uria aalge guillemot	322	167	4		493
Uria lomvia Brunnich's guillemot	21	12	3		36
U. aalge/U. lomvia guillemot/Brunnich's guillemot	46				46
Cepphus grylle black guillemot	6	2			8
Fratercula arctica puffin	18	5	2		25
Phalacrocorax carbo cormorant	2				2
Corvus corax raven	1				1
Corvus corone crow		2			2
SUM ID'd BIRD	**932**	**355**	**13**	**0**	**1300**
MAMMALS					
small mammal	2	1			3
Lepus timidus mountain hare	15	1			16
Castor fiber beaver	18	11			29
Cetacea: Whale family	528	358			529
Small whale	689	430	6		1489
Medium whale	21	7			21
Large whale	72	51			123
Hyperoodon ampullatus bottle-nosed whale	4				4

Table 4.9 (continued)

MAMMALS (ctd.)					
Physeter catodon sperm whale	5	1			6
Orcinus orca killer whale	1	2			3
Globicephala melaena pilot whale	11	2			13
Lagenorhynchus albirostris white-nosed dolphin	39	1			40
L. acutus/L. albirostris dolphin	2017	397	16	9	2439
Phocaena phocaena porpoise	40	75			115
Canidae: Dog family	181	48			229
Canis familiaris dog	61	59	5		125
Vulpes vulpes red fox	48	16			64
Ursus arctos brown bear	12	8			20
Martes martes pine marten	7	1			8
Gulo gulo wolverine	1				1
Lutra lutra river otter	1				1
Phocidae: Seal family	2155	2352	91	12	4610
Large seal	28	51	2	1	82
Erignathus barbatus bearded seal	26	20	1		47
Cystophora cristata hooded seal	1				1
Halichoerus grypus grey seal		3			3
Phoca groenlandica harp seal	102	165	7	1	275
Phoca hispida ringed seal	47	58	2	2	109
Phoca vitulina harbour seal	9	13			22
P. hispida/P. vitulina	66	75	5	2	148
Odobenus rosmarus walrus	3				3
Rangifer tarandus reindeer	205	112	9	2	328
Homo sapiens human	3	1			4
Ovis aries/Caprus hircus sheep/goat		1			1
SUM ID'd MAMMAL	**6418**	**4320**	**144**	**29**	**10911**
Unidentifiable fragments	2270	2022	243	13	4548

As at Gressbakken 3, the relative importance of different taxa is very similar in the north-east and north-west middens, with a few notable exceptions. Birds are far better represented overall in the north-east midden. The total bone sample from this midden is larger than that from the north-west, with slightly more fish and almost 1.5 times as many mammals. In addition, there are over 2.5 times as many birds in the north-east midden than the north-west. The relative importance of different-sized taxa is, however, unreliable in an unsieved assemblage. It may reflect differences in recovery rather than deposition between the middens (see Chapter 5). Comparing taxa with a similar body-size, saithe is somewhat more important relative to other fish in the north-west than the north-east midden. The relative importance of birds is similar in both middens, with guillemots the most important species, followed by willow grouse, common eider and black-backed gull. The mammals also have a similar distribution between the middens, except for a far higher proportion of dolphin bones in the north-east midden.

4.6.3 Gressbakken 5

Simonsen also directed excavations at House 5, where the entire house floor was exposed along with two sections through the seaward mound, one on either side of the entrance passage (Figure 4.20) (Simonsen 1961: 346-361). He revealed a complex sequence of hearths in the interior of the feature, representing at least four phases of construction. An initial rectangular double hearth was rebuilt twice, and finally replaced with a single hearth (Figure 4.21). Simonsen maintains that the large pile of cooking stones located in the centre of all three double hearths was built after them, and before the single hearth. However, Schanche's (1994) excavations at Bergeby and Karlebotnbakken suggest that such stone piles were built up during the use of Gressbakken-type double hearths. None of the phases of occupation at this house have been radiocarbon dated.

The sections through the mound in front of House 5 produced a similar stratigraphic sequence to that from Houses 3 and 4 (Simonsen 1961: 552). Underneath the turf was a light coloured sand between three and eleven centimetres thick. Below this was a thin stony layer found close to the house, but which did not continue into the centre of the mound. Then followed a stony sand layer, also restricted to the area close to the house depression. Beneath this was a continuous midden layer which ranged in thickness from 28-76 cm, and rested on natural gravel. Among the recovered artefacts were quartz and quartzite flakes, ground slate knives and points, stone scrapers, antler harpoons and bone points. Simonsen's plan (Figure 4.20) suggests that roughly one third of the total midden area was excavated, and a slightly larger volume of material was removed from the north-western mound than the north-eastern. These deposits were not sieved, but all visible bone was collected by the excavators (Povl Simonsen, pers. comm. 1998).

During his analysis of the faunal material from Gressbakken 5, Håkon Olsen only identified the bird and land mammal bone. The author re-analysed all of the bone from the site in 1996-1997, identifying the fish and sea mammal bone for the first time. Olsen had sorted the unidentified bone into fish, seal and whale categories, which greatly facilitated the re-analysis, and Pirjo Lahtiperä helped a great deal with the fish identifications. The results of this investigation are presented in Table 4.10.

Table 4.10 Representation of vertebrate taxa at Gressbakken 5 (all values are NISP)

	NE midden	NW midden	TOTAL
FISH			
Gadidae: Cod family	1		1
Gadus morhua cod	27	253	280
Melanogrammus aeglefinus haddock	6	190	196
Pollachius virens saithe	3	26	29
Molva molva ling		20	20
Brosme brosme cusk		4	4
Pleuronectidae: Flatfish family		1	1
SUM ID'd FISH	**37**	**494**	**531**
BIRDS			
small bird	3	19	22
medium bird	8	4	12
Fulmarus glacialis fulmar		49	49
Lagopus lagopus willow grouse	9	15	24
Larus marinus black-backed gull	5	7	12
Plautus alle little auk		1	1
Alca impennis great auk	2	2	4
Uria aalge guillemot	12	15	27
Uria lomvia Brunnich's guillemot	6		6
U. aalge/U. lomvia guillemot/Brunnich's guillemot		24	24
Fratercula arctica puffin		5	5
Corvus corax raven		1	1
SUM ID'd BIRD	**45**	**142**	**187**
MAMMALS			
small mammal	14	14	28
Lepus timidus mountain hare	1		1
Castor fiber beaver		5	5
Cetacea: Whale family	3	66	69
Small whale	490	258	748
Medium whale	5	14	19
Large whale	15	2	17
Orcinus orca killer whale	2		2
Lagenorhynchus albirostris white-nosed dolphin	24	83	107
L. acutus/L. albirostris dolphin	191	69	260
Phocaena phocaena porpoise	24	8	32
Canidae: Dog family	11	6	17
Canis familiaris dog	3	3	6
Vulpes vulpes red fox	7	6	13
Phocidae: Seal family	641	1001	1642
Large seal	188	15	203
Erignathus barbatus bearded seal	7	1	8
Cystophora cristata hooded seal	1		1
Halichoerus grypus grey seal	1	4	5
Phoca groenlandica harp seal	71	51	122
Phoca hispida ringed seal	39	68	107
Phoca vitulina harbour seal	3	2	5
P. hispida/P. vitulina	49	67	116
Odobenus rosmarus walrus	1		1
Rangifer tarandus reindeer	24	49	73
Bos taurus cow		1	1
SUM ID'd MAMMAL	**1815**	**1793**	**3608**
Unidentifiable fragments	197	536	733

There is considerably less bird and fish material in the north-west than the north-east midden at Gressbakken 5, though the relative importance of different taxa is fairly similar. One major exception is the large number of fulmar bones in the north-west midden while this species is absent from the north-east midden. Fulmar is a winter resident of the region. Both winter and summer migratory birds are present in both middens (Renouf 1989: 204-206) and the relative importance of the fish species suggests either a spring or year-round fishery. Among the mammals, dolphins and small whales are far more important in the north-east than the north-west midden, as are large seal bones which are probably from harp seals. Dolphins were also more common in the north-east than the north-west midden at Gressbakken 4. At House 5, ringed seal makes up a larger proportion of the seal taxa in the north-west midden than it does in the north-east.

4.7 Gressbakken Nedre Øst

The Gressbakken Nedre Øst locality is known as *Oaggunnjárga* in Saami, and is the more easterly of the two house-pit clusters at Gressbakken (Figure 4.22). There are at least thirteen house depressions on the site, seven or eight of which belong to the Gressbakken-type. In 1957, Simonsen excavated the house floor and a small sample of the midden mound at House 21, and dug test pits at Houses 22, 23 and 24 which had been disturbed by modern gravel removal (Simonsen 1961: 380-388).

The largest faunal sample from Gressbakken Nedre Øst was recovered from House 23. The eastern edge of the mound surrounding the house-pit was destroyed by gravel removal prior to 1956. This revealed a section with a single cultural layer containing preserved organic remains resting between turf and natural gravel (Simonsen 1961: 386). In 1957, Knut Odner excavated three test pits at this house (ibid), but unfortunately the size and precise location of these units were not published. Several fragments of miniature single-edged ground slate knives were found, along with stone flakes, several bone needles and fragments thereof, and several bone points. There are three radiocarbon dates from this house feature; 3520±40 BP (T-2240), 3600±90 BP (T-2060) and 3800±70 BP (T-2475) (Helskog 1978). The deposits from Odner's test excavations were unsieved and the faunal remains collected by hand, as was standard practice on contemporary excavations led by Simonsen.

Håkon Olsen identified only the bird and terrestrial mammal bone from this house feature. This author subsequently re-examined this material, and identified the fish, seal and small whale bone for the first time. Unfortunately, a single crate of bones labelled "large whale" proved too cumbersome to remove from storage, and this part of the Gressbakken 23 assemblage remains unidentified and unquantified.

Table 4.11 Representation of vertebrate taxa at Gressbakken 23 (all values are NISP)

	TOTAL
FISH	
Gadidae: Cod family	2
Gadus morhua cod	17
Pollachius virens saithe	17
Pleuronectidae: Flatfish family	1
SUM ID'd FISH	**37**
BIRDS	
small bird	4
medium bird	3
Lagopus lagopus willow grouse	5
Uria aalge guillemot	21
SUM ID'd BIRD	**33**
MAMMALS	
Cetacea: Whale family	*
Small whale	1
Lagenorhynchus albirostris white-nosed dolphin	2
L. acutus/L. albirostris dolphin	1
Phocaena phocaena porpoise	2
Canidae: Dog family	2
Phocidae: Seal family	381
Large seal	16
Erignathus barbatus bearded seal	6
Halichoerus grypus grey seal	1
Phoca groenlandica harp seal	37
Phoca hispida ringed seal	13
Phoca vitulina harbour seal	2
P. hispida/P. vitulina	10
Rangifer tarandus reindeer	1
SUM ID'd MAMMAL	**475**
Unidentifiable fragments	76

*a crate of large whale bones has not been identified

The faunal assemblage from Gressbakken 23 is overall quite small and is heavily dominated by seal bones. Cod and saithe are equally represented, suggesting a spring-summer fishery. Given its size, however, the fish sample may not be representative. Among the two identified bird species, guillemot is a spring-summer visitor to Varanger, and willow grouse are present in the area year-round, but are traditionally hunted in the winter. The presence of harp seal in the assemblage indicates spring activity, and ringed seal might have been taken any time between autumn and spring.

4.8 Kalkillebukta

Kalkillebukta is located just south of the Neiden River mouth at the southern end of Neidenfjord in Sør-Varanger kommune. A total of 23 Gressbakken-type houses have been identified at the site, along with several other smaller pits/depressions (Schanche 1994: 31) (Figure 4.23). The houses are positioned on two different alignments, some are aligned east-west along a terrace running in the same direction, and others are aligned north-south along a terrace running in that direction. Erosion at the edge of the north-south terrace has damaged some of the houses, and may have completely destroyed others.

Kjersti Schanche undertook excavations at the site in 1991 (Schanche 1994: 31-43). Initially, she dug test pits in the mounds in front of many of the house features in order to establish the level of organic preservation. Preserved midden material was not found in association with any of the houses at this stage (Schanche 1994: 31). More comprehensive excavations were undertaken at two of the house features: Kalkillebukta 7 along the east-west oriented terrace, and Kalkillebukta 17 along the north-south terrace.

4.8.1 Kalkillebukta 7

A total of 65 square metres were excavated in and immediately around House 7 (Figure 4.24) (Schanche 1994: 32-37). The cultural deposit was up to 50 cm thick in the mound surrounding the house depression. This mound consisted mainly of light brown sand interspersed with charcoal and fire-cracked rock (Figure 4.25). In front of the house, the mound contained traces of midden material indicated by a greasy brown layer with poorly preserved bone and occasional shell fragments. There are three radiocarbon dates from the house: 3475±70 BP (T-9848) on charcoal from the hearth, 3560±170 BP (T-9860) on charcoal from the hearth, and 3765±80 BP (TUa-265) on charcoal from a post-hole (Schanche 1994: 37). Few artefacts were recovered, all of them stone. A single fish hook, a sandstone axe, three quartz scrapers, ten quartz and quartzite cores, and 479 quartz and quartzite flakes comprised the entire artefact assemblage. All of the faunal material at the site came from the thin midden deposit in level 2, and was sieved through 4 mm mesh. Most of the recovered bone was highly fragmented, and only 1.9% of the recovered fragments could be identified.

The faunal material from this house feature was initially identified by Pirjo Lahtiperä of the Zoological Museum in Bergen, and was presented in Hufthammer's (n.d.) report. All of the material was re-analysed as part of this investigation, and a more conservative approach was taken in assigning bones to species. Table 4.12 presents the results of this analysis, and shows one less seal bone and four less artiodactyl bones than Lahtiperä's notes. The predominance of mammal bones at the site is likely a product of the extremely poor preservation conditions (see section 5.3). This assemblage is so small that it will not form a part of the subsequent analysis, except in the discussion of taphonomy in Chapter 5.

Table 4.12 Representation of vertebrate taxa at Kalkillebukta House 7 (all values are NISP)

	level 2
FISH	
Pleuronectes platessa plaice	1
SUM ID'd FISH	**1**
BIRD	
SUM ID'd BIRD	**0**
MAMMALS	
Phocidae: Seal family	2
Artiodactyla: Artiodactyl family	2
Rangifer tarandus reindeer	2
Homo sapiens human	2
SUM ID'd MAMMAL	**8**
unidentifiable fragments	472

4.8.2 Kalkillebukta 17

At House 17, Schanche excavated a total of 66 square metres (Schanche 1994: 37-43) (Figure 4.26). No hearth structure was found, but there was a collection of fire-cracked rocks toward the rear of the house. Prior to excavation, a depression was visible in the front mound, but it proved to be very shallow and the existence of a front entrance passage remains questionable. There were up to 40 cm of cultural deposits in the mound surrounding the house, and midden deposits consisting of dark greasy soil with preserved shell and bone were identified in front of the house (Figure 4.27). In the north-east corner, two lenses/levels of midden were separated by a thin layer of sterile sand (Schanche 1994: 38). The majority of the faunal material from Kalkillebukta 17 comes from this area. There is a single radiocarbon date of 3655±50 BP (T-9861) from the YSA occupation of the house, taken on charcoal from the midden (Schanche 1994: 42).

A later date of 1785±80 (T-9849) from the house relates to a secondary occupation discussed in section 4.2. As at Kalkillebukta 7, few artefacts were recovered. The entire assemblage consists of 326 quartz flakes, 16 quartz cores, one retouched flake, one stone fish hook, one bone point, one bone needle, a fragment of a bone projectile point, a fragment of a bone harpoon, and a single fragment of asbestos-tempered pottery.

Table 4.13 Representation of vertebrate taxa at Kalkillebukta 17 (all values are NISP)

LEVEL	1	2	3	TOTAL 4" screen	Level 2 2" screen	TOTAL 2" & 4" screen
FISH						
Salmo trutta sea trout		1		1		1
Clupea harengus herring		11		11	2	13
Gadidae: Cod family			10	10	8	18
Gadus morhua cod		11	1	12	6	18
Pollachius virens saithe		115	32	147	43	190
Molva molva ling		1		1		1
Pleuronectidae: Flatfish family		7		7		7
Pleuronectes platessa plaice		43	1	44	4	48
SUM ID'd FISH		**189**	**44**	**233**	**63**	**296**
BIRDS						
Somateria mollissima common eider			1	1		1
Tetraonidae: Grouse family		1		1		1
L. lagopus/L. mutus willow grouse/ptarmigan		2		2		2
Tetrao urogallus capercaillie		4		4		4
Alcidae: Auks		2		2		2
SUM ID'd BIRD		**9**	**1**	**10**		**10**
MAMMALS						
Castor fiber beaver		4		4		4
Canidae: Dog family		1		1		1
Canis familiaris dog		2		2		2
Martes martes pine marten		1		1		1
Phocidae: Seal family	1	110	4	114	11	125
Erignathus barbatus bearded seal		1		1		1
Phoca groenlandica harp seal		14		13		13
Phoca hispida ringed seal		2	1	3		3
Phoca vitulina harbour seal		1		1		1
P. hispida/P. vitulina		1		1		1
Artiodactyla: Artiodactyl family		2		2		2
Rangifer tarandus reindeer		2	3	5		5
SUM ID'd MAMMAL	**1**	**141**	**8**	**148**	**11**	**159**
unidentifiable fragments	0	626	87	713	128	841

All deposits from Kalkillebukta 17 were sieved through 4 mm mesh, and a sample of the level two deposit was also sieved through 2 mm mesh. The material was originally identified by Pirjo Lahtiperä of the Zoological Museum, and discussed in a report by Hufthammer (n.d.). The author re-analysed the mammal bone from the site, but the fish and bird identifications presented in Table 4.13 are from Lahtiperä's notes (on file at the Zoological Museum, Bergen). Levels 1 and 2 in the table were separated from level 3 by

a layer of sterile sand (Kjersti Schanche pers. comm.). Preservation was considerably better than at Kalkillebukta 7, but not as good as that at Gressbakken, Bergeby or Karlebotnbakken. A higher percentage of the large mammal bone from the site scored two or three on Behrensmeyer's (1978) weathering scale than at the other sites mentioned. The ratio of identifiable bone to total number of fragments was also lower than at Bergeby and Karlebotnbakken. In level one, 35.1% of the bone was identified, in level two 37.9% and in level three 35.4% (values are for 4" screen only).

Few faunal remains were recovered from levels 1 and 3 at Kalkillebukta, which makes a comparison between levels difficult. The bulk of the faunal sample comes from level 2. The composition of fish species is unlike that from any of the other Gressbakken-type houses excavated to date. Saithe far outnumber any other fish species, and Hufthammer (n.d.) argues that this indicates short-term summer use of the site. Few birds are found in the assemblage, and over 90% of the identified mammal remains are seal.

4.9 Høybukt

Høybukt, the Saami *Núvvusgohppi*, is a bay situated roughly six kilometres west of Kirkenes, on the south side of Korsfjord, another of the smaller fjords branching off of Varangerfjord. Across Korsfjord from Høybukt is the large island of Skogerøy. At a locality known as Høybukt Southeast, on the east side of Høybukt bay, Knut Odner mapped a row of four Gressbakken-type houses on a terrace 20 m above the modern sea level (Simonsen 1963: 219-220). The houses were oriented SW-NE, with a large midden mound on their downhill side (Figure 4.28). There are no radiocarbon dates from the site.

4.9.1 Høybukt 2

Knut Odner excavated an eight square metre trench through the seaward midden mound at House 2 (Simonsen 1963: 220-222). Unlike most other Gressbakken-type houses, Høybukt 2 had no indication of an entrance passage through the midden mound. The stratigraphic sequence in the mound (close to the edge of house depression) was as follows: a three centimetre thick layer of sand and gravel rested on ten centimetres of coarse gravel and earth. Below these gravel layers was a thick deposit (47 cm on average) of black soil with shell and bone, and below that beach gravel. A limited

number of artefacts were found, among them stone flakes and a quartzite core along with bone chisel fragments, 2 bone/antler harpoons and a bone needle.

4.9.2 Høybukt 4

Knut Odner also excavated a seven by three metre area inside the house depression and a section through the midden mound at House 4 (Simonsen 1963: 222-226) (Figure 4.29). The stratigraphic sequence in the seaward mound was identical to that from Høybukt 2, though the upper grey sand and gravel layer was nine centimetres thick, the coarse mixed gravel eleven centimetres thick, and the midden layer 31 cm thick. Flakes and cores of quartzite and quartz were relatively common. A bifacially flaked quartz point and a ground slate point were also found. Bone and antler artefacts included chisel fragments, two harpoons and a fish hook. The majority of the faunal remains come from the midden deposit, though all bones from the entire house feature were hand collected as a single unit.

4.9.3 Fauna

At both Høybukt 2 and Høybukt 4, the author examined only the seal material. The NISP values for all non-seal taxa in Table 4.14 are taken from Olsen's notes at the Zoological Museum, Bergen. The faunal assemblages from Houses 2 and 4 have strong similarities. Cod and saithe make up almost the entire fish assemblage at both houses, in proportions suggestive of a year-round fishery. Bird bones are scarce at both houses features, while large numbers of seal bones suggest that sealing was an important activity.

Table 4.14 Representation of vertebrate taxa at Høybukt 2 and 4 (all values are NISP)

	House 2	House 4
FISH		
Sebastes marinus bergylt/sea perch	1	
Gadus morhua cod	51	16
Pollachius virens saithe	29	10
Molva molva ling		1
Pleuronectes platessa plaice		
SUM ID'd FISH	**81**	**27**
BIRDS		
Somateria mollissima common eider	1	5
Lagopus lagopus willow grouse		1
Plautus alle little auk	2	
Uria aalge guillemot	6	2
SUM ID'd BIRD	**9**	**8**

Table 4.14 (continued)

MAMMALS		
Lepus timidus mountain hare		5
Small rodent	10	
Lemmus lemmus lemming	2	
Castor fiber beaver	2	1
Large whale		4
Lutra lutra river otter	1	
Phocidae: Seal family	456	320
Large seal	16	5
Erignathus barbatus bearded seal		1
Phoca groenlandica harp seal	25	18
Phoca hispida ringed seal	10	2
Phoca vitulina harbour seal	1	2
P. hispida/P. vitulina	8	8
Rangifer tarandus reindeer	7	5
SUM ID'd MAMMAL	**538**	**371**
Unidentifiable fragments	718	445

4.10 General trends in late YSA faunal exploitation

As Chapter 5 will demonstrate, comparisons between sieved and unsieved faunal assemblages in terms of the relative importance of different taxa can be misleading since small-bodied taxa will be under-represented in the unsieved collections. However, a brief comparison within each of the three major categories of fish, bird and mammal suggests some broad trends. In comparing within and not between these categories, some of the problems of differential recovery are avoided. Biases no doubt still exist, but the similarities between many of the sieved and unsieved assemblages suggest that these trends are real.

4.10.1 Fish

Cod, haddock and saithe make up the bulk of the fish remains at all of the study sites. The relative importance of these species is fairly consistent at the inner-fjord sites of Bergeby, Karlebotn and Gressbakken (Figure 4.30). At all of these sites, cod far outnumbers the other two species, which make only small contributions to the assemblages. Bergeby 18 differs slightly from the other inner-fjord sites in that saithe is better represented than at Karlebotnbakken or the Gressbakken assemblages (see section 4.3.2).

The only large fish assemblage from the outer-fjord comes from Kalkillebukta 17, and paints a completely different picture. At this site, the fish remains are dominated by

saithe, with only a small amount of cod, and no haddock. As discussed above (section 2.6.4) saithe is a predominantly summer fish, while cod is present in Varanger year round, with a large influx in the spring. The differences in the proportions of these species may indicate different seasons of occupation. Kalkillebukta 17 certainly stands apart from the inner-fjord sites and suggests a summer occupation. This cursory examination of the fish remains suggests the possibility that the Gressbakken phase sites in the inner and outer fjord represent either two different seasonal elements of a single subsistence-settlement system, or two completely separate systems. Unfortunately, Kalkillebukta 17 is presently the only large fish assemblage from the outer-fjord for comparison.

4.10.2 Birds

The incredible variety of birds found in many of the Gressbakken phase faunal assemblages makes it difficult to select a few key species for general discussion. This variety is particularly marked in the large assemblages from Bergeby 18, Gressbakken 3, and Gressbakken 4. While there are too many taxa to permit a straightforward graphical summary, auks stand out as the most common bird family at almost all of the study sites. Among these, common guillemots (*Uria aalge*), which form large breeding colonies around Varangerfjord during the summer months, are particularly numerous. One exception to this rule is Gressbakken 5, where fulmar (*Fulmarus glacialis*), a winter migrant, is the most common species of bird.

4.10.3 Mammals

A range of small and medium sized mammals including beaver, pine marten and dog appear in the Varanger assemblages. However, the identified mammal bones from the study sites are dominated by seal, and to a lesser extent by whale, dolphin, and reindeer. The mammalian remains from the outer-fjord assemblages at Kalkillebukta 17, Høybukt 2 and Høybukt 4 are all comprised almost exclusively of seal bones (Figure 4.31). Reindeer make up less than 4% of the mammals in these collections, and there are very few, if any, whale and dolphin bones.

There is more variation between the inner-fjord sites. While reindeer bones comprise less than 5% of the mammalian remains at Bergeby 18, Advik B and the three Gressbakken assemblages, they make up nearly half the mammal bones at Karlebotn 1.

Reindeer bones actually outnumber seal bones on the site, making it unique among the studied assemblages. As discussed above (section 4.4.1), the importance of reindeer at Karlebotnbakken probably results from the site's location directly on a main reindeer migration route. The mammalian assemblages from Bergeby 18 and Advik B resemble those from the outer-fjord sites, dominated as they are by seal (at over 90%), with small amounts of reindeer and even fewer whale and dolphin bones. In the three Gressbakken assemblages, however, whale and dolphin bones far outnumber reindeer, accounting for between 36% and 46% of the mammal remains. At all of the other sites in the study sample whales account for less than 3% of the mammals. Here, again, geography may play a role. Whales tend to strand themselves in areas of shallow water with a gently sloping foreshore. Under such conditions, the angle of the ocean floor distorts their echo-location signals (Dudock van Heel 1962). At the time the site was occupied, the small islands just north of Gressbakken would have formed a large area of shallow foreshore (see Figure 2.3), which may have been conducive to whale stranding. A few kilometres to the west, the modern peninsula of Veines would have been cut off from the mainland by water, creating a large natural trap for whales. Renouf suggests (1989: 210) that the occupants of Gressbakken might have not only taken advantage of naturally stranded large whales, but deliberately driven dolphins and possibly larger whales into this shallow area. There is no evidence, however, that the occupants of nearby Advik were capitalising on the local geography in the same way.

4.11 Summary

The faunal assemblages which form the basis of this study were recovered using different techniques and vary greatly in size. The larger assemblages contain an incredible range of identified taxa, while the smaller ones include only a handful of taxa. With the exception of Karlebotn, where there is a roughly equal mix of marine and terrestrial species, they all show an overwhelming reliance on marine resources. While the relative importance of mammalian species may vary between sites due to differences in local availability, the proportions of fish species on each site probably reflect the season of occupation. Though there is very limited evidence from the outer-fjord at this stage, the evidence from Kalkillebukta suggests that the Gressbakken-type houses on the coast of the outer-fjord may have constituted summer fishing and sealing camps as opposed to the more permanently occupied, multi-purpose sites of the inner-fjord.

CHAPTER 5

THE TROUBLE WITH BONES

5.1 Introduction to the taphonomy of the Varanger assemblages

Taphonomy deals with the formation and preservation of the archaeological or palaeontological record. It has been more precisely defined as "the study of the processes of preservation and modification, and how they affect geological, biological, and cultural information in the geological record" (Koch 1989: 2). Any faunal assemblage from an archaeological site has a long history of taphonomic modifications (Figure 5.1). Interpreting past human behaviour using animal bones is, by definition, a taphonomic study, and must take into account all non-human taphonomic factors as well. Despite many recent studies of carnivore impact (e.g. Andrews & Evans 1983; Binford 1981; Brain 1981; Cruz-Uribe 1991; Haynes 1983; Morey & Klippel 1991; Stiner 1991), weathering (e.g. Behrensmeyer 1978; Gifford 1981; Lyman & Fox 1989), bone diagenesis (e.g. Allison & Briggs 1991; Bennett 1999; Child 1995; Gordon & Buikstra 1981; Hare 1980; Hedges & Millard 1995; Lucas & Prévôt 1991; Martill 1990; Nicholson 1996; White & Hannus 1983) and other biological and physical processes acting on bone assemblages (e.g. Lyman 1994, and references therein; Stiner *et. al.* 1995), the interaction of these agents to produce an observed level of bone preservation is still a poorly understood phenomenon. Given the number of destructive processes which intervene between past human activity and modern interpretation, multi-causality is an ever-present problem for zooarchaeologists.

This chapter examines the taphonomy of the Varanger faunal material, investigating the formation history of the assemblages. Bone preservation is generally excellent, but potential biases exist as a result of both prehistoric and modern processes. First, pre-depositional factors will be considered. The YSA hunter-gatherers of Varanger were the first to influence the animal bone assemblages. This chapter discusses some of the direct evidence of human behaviour, while more indirect evidence is discussed in subsequent chapters. Carnivores were another factor to affect the bone assemblages prior to burial. Second, the burial conditions themselves will be addressed. Both the rate of deposition and the burial environment played a major role in bone preservation. Third,

archaeological recovery is of particular importance when discussing potential biases within the study sample. Deposits from some of the sites in question were sieved through four millimetre mesh, while others were not sieved at all. Several tests will be used to assess the influence of the two different excavation strategies on faunal recovery. Finally, quantification techniques used in faunal analysis affect both the absolute numbers and the relative importance of different species and different skeletal elements. The quantification methods employed in this thesis will be explained and discussed.

5.2 Pre-depositional processes

What processes affected the animal bones in this study before they were deposited in the middens around Varangerfjord? Human agency is suggested by their close association with prehistoric dwellings and artefacts. There is also more direct evidence of human manipulation in the form of cutmarks indicating butchery and bone breakage indicating marrow extraction. Bone and antler were also used to produce a wide variety of tools, a process which will be discussed at greater length in Chapter 7. Non-human modification of the bone assemblage is indicated by evidence of carnivore gnawing.

5.2.1 Cutmarks

Many of the mammal bones from the Varanger sites display cutmarks indicating skinning and butchery by humans. A list of the number of specimens with cutmarks is presented for mammalian taxa by element in Appendix A (Table A.1). Cutmarks were noted on harp seal, ringed seal (Figure 5.2), bearded seal, whale, dolphin and reindeer bones (Figure 5.3). The number of specimens with cutmarks constitutes only a small proportion of the total material recovered. Nonetheless, these cutmarks confirm that the recovered bone assemblages are the product of human deposition. While illustrating human manipulation, the presence of cutmarks is unlikely to have influenced the survival of the bone assemblage.

5.2.2 Marrow extraction

Bone breakage for marrow extraction is another clear indicator of the human impact on the assemblage, and may have affected preservation, recovery and identifiability of the bones. Many of the reindeer longbones in the Varanger assemblages have been processed for marrow. In most cases, the epiphyses have been broken off transverse to the shaft, which would allow the marrow to be pushed out of the tube formed by the

shaft. Proximal radii (Figure 5.4) and distal tibiae (Figure 5.5) broken in this way are particularly common. A similar method of extracting marrow from caribou bones is documented ethnographically among the Nunamiut (Binford 1978: 155). They break off the ends of the bones using a hammerstone, and then poke out the marrow using a willow twig. Reindeer metapodials from Varanger tend to be broken longitudinally rather than transversely (Figure 5.6). This type of fracture is doubtless facilitated by the deep groove which runs down the front of all artiodactyl metapodials. The Nunamiut also process caribou metapodials in this fashion, splitting them lengthwise from the centre of the proximal articulation using a knife struck with a maul (Binford 1978: 147). A complete list of the reindeer longbone ends processed for marrow at each of the study sites in Varanger is presented in Appendix A (Table A.2).

The level of reindeer marrow and bone grease exploitation around Varangerfjord suggests that the occupants of these sites had a sufficient supply of fat and nutrients from other sources. Marrow extraction was focused on the large longbones, while potential sources of smaller quantities of marrow were overlooked. Among the longbones, radii, tibiae, metacarpi and metatarsi are most commonly broken for marrow. Humeri show less frequent signs of marrow extraction, and femora show none at all. Femur fragments are, however, rare on all sites. Less important marrow-bearing bones such as mandibles and phalanges almost never show signs of marrow extraction. The only "marginal" bone exploited for marrow in the studied assemblages was a single first phalanx from Bergeby 18 which had been split lengthwise. The extraction of bone grease in documented hunter-gatherer groups from northern latitudes involves crushing longbone ends and axial elements into small pieces and boiling them (Outram 1998: 14-16). The large number of complete reindeer longbone epiphyses present in the Varanger material suggests that grease extraction was not taking place. Had the Gressbakken-phase hunter-gatherers of Varangerfjord been under dietary stress, a much higher level of within-bone nutrient extraction (both of marrow and grease) would be expected. The resources of the Varangerfjord coast appear to have ensured a sufficient supply of food during the occupation of these base camps.

There is no evidence for human breakage of the seal bones from Varanger in order to extract nutrients. This probably relates to the structure of these bones rather than to the lack of dietary stress. Unlike terrestrial mammal longbones, seal longbones do not have

a marrow cavity. Instead, their longbone shafts are filled with trabecular (or cancellous) bone, the spongy bone which makes up the axial elements of both terrestrial- and sea-mammal skeletons. This means that marrow cannot be easily removed from seal longbones. Seal bone grease is also difficult to extract because it is liquid at room temperature. It cannot be released from the bone by boiling and can only be rendered at low temperatures using modern technical equipment (Shahidi *et al.* 1994; Outram 1998: 245).

As a result of marrow extraction by humans, reindeer longbones tended to enter the middens of Gressbakken-type houses in a more fragmented state than those of seals. Lyman (1991) found a similar pattern at sites in Oregon where pinniped bones demonstrated little evidence of marrow extraction by humans in comparison to ungulate bones at the same sites. Cruz-Uribe and Klein (1994) also found that seal bones were far more complete than ungulate bones on South African coastal sites. In both cases, the authors attribute the relative lack of human processing of seal bones to the fact that any digestible organic matter is dispersed throughout these bones rather than concentrated in a medullary cavity (Cruz-Uribe & Klein 1994: 40; Lyman *et al.* 1992: 537).

In the Varanger assemblages, the level of fragmentation may have affected the relative resilience of reindeer versus seal bone to post-depositional destructive processes. Because many of the seal bones in Varanger entered the middens whole, they stood a better chance of surviving destructive processes. Differential fragmentation has no doubt also affected the identifiability of reindeer and seal bones. Reindeer longbones were often broken into a number of pieces during marrow extraction; two or more epiphysial fragments, and a number of shaft fragments. Shaft fragments are generally difficult to identify compared to the more diagnostic epiphysial fragments. Seal bones, on the other hand, were not subject to deliberate breakage and often survived intact. This means that fragment counts such as NISP will over-estimate the number of reindeer relative to seal bones, while derivations of minimum numbers such as MNI and MNE will under-estimate the number of reindeer relative to seal bones. For a more detailed discussion of these units of quantification see section 5.5.

5.2.3 Carnivore activity

The bones of several terrestrial carnivores have been recovered from the late YSA middens around Varangerfjord. These include brown bear and canids such as dog, red fox and possibly wolf. Dogs are the most likely to have had an impact on the Varanger assemblages, since they were presumably living on the sites alongside the human occupants. Experimental work has shown that dogs can significantly alter a bone assemblage by increasing fragmentation, destroying whole bones or parts of bones, and transporting bones around a site (e.g. Binford 1981: 35-81; Kent 1981).

Carnivores, however, appear to have affected the Varanger bone assemblages to only a minor degree. Evidence of carnivore gnawing in the form of scoring, pitting, punctures and furrows (Binford 1981: 44-48) occurs on only a small proportion of the bones at each of the study sites (Table 5.1). Chewed seal bones consistently form less than 3% of the identified seal NISP, and chewed reindeer bones less (usually much less) than 13% of the total reindeer NISP. With the possible exception of reindeer bones at Gressbakken 4, none of these assemblages appears to have been seriously altered by carnivore activity. The Gressbakken 4 reindeer bone has by far the highest percentage of carnivore-chewed bone at just under 13%. A breakdown of carnivore damage by element and taxon is presented in Appendix A (Table A.3).

Table 5.1 Percentage of identified mammal bone (NISP) showing evidence of carnivore chewing at each of the study sites.

Site	% seal	% reindeer	% total mammal
Bergeby 18	0.1	0	0.1
Karlebotn 1	0	1.2	0.6
Advik B	0	0	0
Advik J	2.3	7.4	2.6
Gressbakken 3	0.4	3.6	0.6
Gressbakken 4	1.3	12.8	1.6
Gressbakken 5	2.7	4.1	2.5
Gressbakken 23	2.8	0	2.7
Kalkillebukta 17	0	0	0
Høybukt 2	0	0	0
Høybukt 4	0	0	0

Note: None of the surviving mammal bone at Kalkillebukta, Bugøyfjord or Høybukt shows signs of carnivore damage.

At all sites with carnivore-chewed bone, the reindeer bone is more heavily chewed than the seal bone. The only exceptions to this are Gressbakken 23, where only one reindeer bone was recovered (that unchewed), and Bergeby 18 where no chewed reindeer bone was recovered, and only a tiny proportion of the seal bone showed signs of carnivore damage. Figure 5.7 illustrates some typical carnivore damage to reindeer elements. It has been demonstrated above (section 5.2.2) that marrow extraction created a bias in the relative representation of reindeer versus seal elements in the studied assemblages. By fragmenting, damaging, or even destroying more reindeer than seal bones, dog gnawing compounded this bias to some degree.

5.3 Depositional environment

The soils around Varangerfjord are thin and acidic, and account for the paucity of faunal material from the Older Stone Age and Early Metal Period. The large amount of bone recovered from Younger Stone Age contexts is anomalous, and comes almost exclusively from midden deposits. With the exception of Kalkillebukta House 7, the bone from all of the sites in the study sample is extremely well preserved. A visual inspection of the bones suggests that the assemblages are not overly fragmented and contain an unusually large number of complete bones. Table 5.2 compares the number of complete seal longbones to the number of seal longbone fragments in the three largest faunal assemblages in the study sample: Bergeby 18, Gressbakken 3, and Gressbakken 4. Generally, between one fifth and one half of all seal humeri, radii, ulnae and femora from the Varanger sites are intact. Tibiae and fibulae are more fragmented because they are longer and thinner than any of the other longbones, giving them a lower tolerance to external stress.

The large number of complete seal bones in the assemblages contributes to the impression that the collections are well-preserved. However, seal longbones are short and stubby relative to those of terrestrial mammals of comparable size, making them less subject to breakage caused by trampling or compression. In addition, the structure of seal longbones makes them less subject to human breakage for marrow and grease extraction than terrestrial mammal bones, as described above (section 5.2.2). Although numbers of whole and fragmented bones are rarely published for each skeletal element, written descriptions of other seal bone assemblages suggest that the situation in

Table 5.2 Numbers of whole seal longbones versus seal longbone fragments at Bergeby 18, Gressbakken 3 and Gressbakken 4.

	Bergeby 18			Gressbakken 3			Gressbakken 4		
	# whole	# frags	% whole	# whole	# frags	% whole	# whole	# frags	% whole
Humerus	15	21	**41.7**	27	66	**29.0**	29	69	**29.6**
Radius	17	47	**26.6**	12	54	**18.2**	13	24	**35.1**
Ulna	13	39	**25.0**	18	46	**28.1**	25	39	**39.1**
Femur	24	25	**49.0**	35	35	**50.0**	33	38	**46.5**
Tibia*	2	54	**3.6**	9	132	**6.4**	8	86	**8.5**
Fibula*	2	44	**4.3**	6	68	**9.1**	3	47	**6.0**

*In the seal skeleton, tibia and fibula are fused proximally to form the *os cruris*. They are treated separately here because they rarely remain attached in archaeological contexts. A complete os cruris is recorded under both tibia and fibula.

Varanger is not unique. Outram's study of bone fragmentation at the Norse farmstead of Niaquussat, Greenland found "many very well preserved whole [seal] bones representing all portions of the skeleton" (Outram 1998: 237). Similarly, at the Palaeoeskimo site of Qeqertasussuk, also in Greenland, he noted that while smaller fragment sizes dominated among the seal bone, there were also a considerable number of whole bones "with both axial and appendicular (particularly appendicular elements) surviving undamaged" (Outram 1998: 240).

Each of the YSA middens produced a micro-environment conducive to bone preservation. The bone surfaces show little evidence of weathering, suggesting that they spent little time exposed to the elements prior to burial and indicating a high rate of accumulation for the middens. Alkaline mollusc shell was deposited along with the bone helping to neutralise the acidic soil and prevent chemical destruction of the bones. Large amounts of other organic material must also have been deposited on the middens, breaking down to form "rich, dark soil which produced essentially anaerobic preservation conditions" (Schanche 1994: 90—my translation). The oxygen-poor environment within this "midden muck" would have prevented microbial decomposition of the bone assemblages.

The quality of preservation within the middens appears to depend on the size of the deposit. The large mounds at the front of most Gressbakken-type houses are comprised of thick layers of midden containing extremely well-preserved bone. However, in cases

where the midden deposit is thin, bone preservation is poor. This is well illustrated by the two excavated houses at Kalkillebukta. At House 7, midden deposits appeared only as small lenses up to 3 cm thick, rather than as a discrete layer. The recovered bone was highly fragmented and only 1.9% could be identified to element and taxon. At House 17, a thicker midden layer of up to 11 cm thick contained better-preserved, less fragmented bone, 38% of which could be identified. High rates of identification are also found in the other assemblages from midden deposits over 10 cm thick. At Bergeby 18 the midden was up to 80 cm thick and 38% of all faunal remains could be identified. At Karlebotnbakken 41% of the faunal material from the 28 cm thick midden was identified[1]. These high levels of identification reflect good preservation in each assemblage as a whole, not just among the seal bones. Schanche found traces of bone to the rear of the excavated houses at Bergeby and Kalkillebukta (Schanche 1994: 90). It was, however, so decomposed that it could not be collected. This suggests that small amounts of bone were deposited behind the Gressbakken-type houses, but not in sufficient number, and perhaps not in association with the other refuse needed to produce favourable preservation conditions.

5.4 Recovery

The faunal assemblages discussed in this thesis were collected over a period of almost forty years. Excavation strategies have evolved considerably over that time, and levels of recovery changed along with them. Advik and Gressbakken were both excavated by Povl Simonsen in the mid- to late 1950s (Simonsen 1961). Work at Høybukt was undertaken by Knut Odner at the same time (Simonsen 1963). Sieving was not standard practice on archaeological sites at this stage, and neither Simonsen nor Odner sieved the excavated deposits to ensure a consistent level of faunal recovery. All faunal material from these excavations was hand collected by the excavators (Povl Simonsen, pers. comm. 1998). Almost thirty years later, Schanche's excavations at Karlebotn, Bergeby and Kalkillebukta reflect the changing standards in archaeological sampling. All cultural deposits from these sites were dry sieved through 4 mm mesh (Schanche 1994).

[1] Deposits from all of the sites mentioned were sieved through 4mm mesh. Identification rates from the remaining unsieved sites cannot be used for comparison because hand collection results in the inconsistent recovery of different fragment sizes.

The representativity of an unsieved faunal sample depends greatly on the ability of individual excavators to distinguish bone and bone fragments from the surrounding matrix. The rate of recovery will doubtless vary between excavators and be influenced by factors such as weather conditions and time pressures. Large fragments, since they are more visible, will be recovered more consistently than smaller ones. As a result, smaller taxa may be under-represented in an unsieved assemblage. While any sieved assemblage will be biased against elements and fragments small enough to fall through the mesh, such bias is consistent and predictable. In an unsieved assemblage, the biases are more unpredictable and difficult to quantify.

The effect of different screening techniques on faunal recovery is well-documented in the literature. It has been repeatedly demonstrated that larger mesh sizes bias against small taxa (e.g. Casteel 1972; Payne 1972, 1975) and the smaller skeletal elements within any given taxon (Shaffer 1992; Shaffer & Sanches 1994). Several different correction factors have been proposed to compensate for this effect based on the use of control samples during excavation (James 1997; Thomas 1969). Recently, several authors have discussed the implications of size-related bias on faunal indices frequently used by zooarchaeologists (Cannon 1999; James 1997). Such indices are calculated to show the relative importance of two different taxa, often of very different size. For example, the Artiodactyl Index is used frequently in discussing sites in the American Southwest and compares artiodactyls (deer and antelope) with leporids (jackrabbits and cottontails). The index can be greatly influenced by screen size since leporid recovery improves greatly as mesh size decreases, while artiodactyl recovery remains relatively unchanged. All of these studies act to question the validity of inferences about "temporal or spatial trends in the abundances of large-bodied taxa relative to small-bodied taxa, especially in cases where large mesh sizes or no screens at all were used in excavation" (Cannon 1999: 205).

The relative numbers of fish, birds and mammals in the Varangerfjord assemblages clearly reflect the recovery techniques used. Figure 5.8 illustrates the proportion that each of these three categories contributes to the total NISP at each of the study sites. Two additional faunal assemblages are also included for comparison: Iversfjord and Area 11 at Nyelv Nedre Vest. Iversfjord is located on the north side of Hopsfjord, a western arm of Tanafjord (Figure 3.1). The site's faunal sample is from a large free-standing

midden dating to the first half of YSA period III (E. Helskog 1980, 1983). The midden was completely excavated, with the upper levels of one quadrant dry sieved using 5 mm mesh, and all other deposits dry sieved using 1 mm mesh (E. Helskog 1983: 28). The sample from Nyelv Nedre Vest Area 11 is from several midden deposits associated with a Nyelv-type house and dating also to the first half of YSA period III (Renouf 1981, 1989). All of the Nyelv material was water sieved using 1.5 mm mesh.

Figure 5.8 shows a general trend towards increased numbers of mammals relative to birds from left to right. While this pattern might be interpreted as an increasing reliance on mammals relative to fish over the course of YSA period III, it more likely reflects the increase in mesh size from left to right. Fish clearly make up a much larger proportion of the total NISP in assemblages which have been sieved than in those which have not. While the sieved assemblages are heavily dominated by fish, the unsieved ones are dominated by mammals. At Iversfjord and Nyelv where the smallest mesh sizes were used, fish account for close to 100% of all remains. At Bergeby 18, Karlebotnbakken and Kalkillebukta 17, all excavated using 4 mm mesh, fish make up between roughly 50 and 70 percent of each assemblage. At the remaining sites, all unsieved, fish remains comprise less than 30% of the identified bones. The only exception to this pattern is at Gressbakken 3. Here, though the deposits were not sieved, fish make up 75%, mammals 20% and birds 5% of the total NISP. The percentage of fish here is actually greater than at any of the sites excavated using 4 mm dry sieving. This marked difference between Gressbakken 3 and the other unsieved sites may indicate that a much larger percentage of fish bones was originally deposited on this midden than on the other unsieved middens. Alternatively, or in addition, excavators may have successfully recovered a larger percentage of the fish bone at Gressbakken 3 than at the other unsieved sites.

Because of the biases inherent in unsieved assemblages of small-boned taxa (such as fish and birds) and the problems encountered when comparing them with similar sieved assemblages, this analysis focuses on large-bodied mammal remains. However, it remains to be demonstrated that the unsieved samples of seal and reindeer bones from Simonsen's excavations are representative and can be legitimately compared to the sieved samples from Schanche's excavations. Not only is there a bias in unsieved assemblages towards larger taxa, but there is also a bias towards larger elements of any given taxa (Payne 1972, 1975). Smaller elements such as carpals, tarsals and phalanges

will be poorly represented relative to the larger limb bones in a seriously biased unsieved assemblage (Payne 1975: 14).

Tables 5.3 and 5.4 present the numbers of longbones (plus scapulae) relative to carpals, tarsals and phalanges for seals (Table 5.3) and reindeer (Table 5.4) in the largest sieved and unsieved samples from Varangerfjord. The values in the tables are percentages of the sum total of adjusted NISP or MAU in each column. NISP is the number of specimens (whole bones or fragments) of a given element, while MAU is based on MNE, the minimum number of that element indicated by the specimens (for a full discussion of quantification methods see section 5.5). Skeletal elements occur in different frequencies in a complete skeleton. NISP and MNE are therefore standardised to facilitate comparison between elements. To do this, values for each element are divided by the number of that element in a complete skeleton and multiplied by two. In practice, this means that many of the NISP and MNE values remain unchanged because most of the elements in question are paired in a complete skeleton. Therefore, many of the calculations which would be necessary if they were simply divided by the number of each element in a complete skeleton are avoided. The standardised NISP values which result are called "adjusted NISP", the standardised MNE values "MAU".

Table 5.3 shows that the small flipper bones of seals are similarly represented in sieved and unsieved assemblages. The only notable difference is that carpals and small tarsals (i.e. tarsals other than astragalus and calcaneum) are slightly better represented in the sieved assemblages. The relative proportions of limb bones to carpals, tarsals and phalanges are presented graphically in figures 5.9 (NISP) and 5.10 (MAU). While the sieved assemblage from Karlebotn has a slightly higher ratio of extremities to limbs using both methods of quantification, there is virtually no difference between the sieved assemblage from Bergeby 18 and the unsieved assemblages from Gressbakken 2 and Gressbakken 3.

Table 5.3 Representation of seal longbones versus carpals, tarsals and phalanges in sieved and unsieved assemblages from Varangerfjord[2].
Values in parentheses indicate number of each element in a complete skeleton. All other values represent percent of the sum total of adjusted NISP or MNE values in each column (rounded to the nearest whole percent).

SEAL	4 mm dry sieved				unsieved			
	Bergeby 18		Karlebotn 1		Gressbakken 3		Gressbakken 4	
	adjusted NISP (%)	MAU (%)	adjusted NISP (%)	MAU (%)	adjusted NISP (%)	MAU (%)	adjusted NISP (%)	MAU (%)
scapula (2)	**13**	11	**17**	8	**22**	23	**21**	18
humerus (2)	**9**	9	**15**	14	**12**	12	**18**	15
radius (2)	**15**	14	**13**	13	**10**	12	**7**	9
ulna (2)	**13**	10	**16**	18	**10**	12	**10**	12
femur (2)	**12**	13	**12**	15	**11**	11	**13**	13
tibia (2)	**14**	8	**14**	9	**21**	9	**18**	12
carpals (14)	**1**	2	**1**	2	**0**	0	**0**	0
astragalus (2)	**5**	7	**3**	6	**2**	3	**4**	6
calcaneum (2)	**4**	6	**4**	6	**2**	2	**2**	6
other tarsals (10)	**2**	3	**1**	2	**0**	0	**0**	0
phalanx 1 (20)	**6**	7	**1**	2	**4**	6	**2**	4
phalanx 2 (16)	**3**	4	**1**	2	**3**	5	**2**	3
phalanx 3 (20)	**3**	4	**1**	2	**2**	4	**1**	2

The proportions of reindeer extremities versus limbs are likewise very similar at both sieved and unsieved sites (Table 5.4). Here, carpals may be slightly better represented in the sieved assemblages. Phalanges appear to be better represented at Karlebotn 1 than at any of the other three houses. Based on the NISP values, there is little difference in the overall representation of small distal limb bones relative to larger upper limb bones at any of the houses (Figure 5.11). If anything, extremities are better represented than the main limb bones in the unsieved assemblage from Gressbakken 4 than in the sieved assemblages. When MAU values are used, the proportion of extremities increases at Karlebotn 1, slightly surpassing that from Gressbakken 3 (Figure 5.12). However, the proportions at Bergeby 18 (sieved) and Gressbakken 3 (unsieved) remain almost

[2] The raw NISP and MNE values from which the figures in Table 5.3 are derived are presented in Appendix A (Table A.4).

identical and there is no obvious correlation between sieving and better representation of smaller bones than larger ones.

Table 5.4 Representation of reindeer longbones versus carpals, tarsals and phalanges in sieved and unsieved assemblages from Varangerfjord[3].
Values in parentheses indicate number of each element in a complete skeleton. All other values represent percent of the sum total of adjusted NISP or MNE values in each column (rounded to the nearest whole percent).

REIN-DEER	4 mm dry sieved				unsieved			
	Bergeby 18		Karlebotn 1		Gressbakken 3		Gressbakken 4	
	adjusted NISP (%)	MAU (%)	adjusted NISP (%)	MAU (%)	adjusted NISP (%)	MAU (%)	adjusted NISP (%)	MAU (%)
scapula (2)	**18**	20	**13**	9	**25**	14	**24**	17
humerus (2)	**9**	10	**11**	10	**3**	4	**11**	13
radius (2)	**19**	15	**16**	12	**28**	24	**15**	10
ulna (2)	**4**	7	**4**	7	**6**	11	**6**	8
femur (2)	**18**	12	**17**	3	**6**	7	**3**	1
tibia (2)	**13**	7	**21**	14	**12**	14	**13**	12
carpals (10)	**3**	7	**1**	3	**0**	1	**0**	1
astragalus (2)	**5**	7	**4**	7	**5**	9	**7**	12
calcaneum (2)	**9**	10	**4**	8	**11**	9	**15**	18
other tarsals (4)	**1**	2	**2**	5	**2**	4	**3**	5
phalanx 1 (8)	**0**	1	**4**	12	**1**	1	**1**	2
phalanx 2 (8)	**0**	1	**3**	7	**1**	1	**1**	0
phalanx 3 (8)	**0**	0	**1**	2	**1**	1	**0**	1

This examination suggests that there is not a strong bias towards larger elements among the mammal bone from the unsieved assemblages in Varanger. This reflects well on the quality of the earlier excavations. The two smallest classes of bones, carpals and small tarsals (i.e. tarsals other than astragalus and calcaneum), may be slightly better represented in the sieved assemblages. However, carpals and tarsals do not feature prominently in the analysis which follows and this slight bias is unlikely to affect the results. While other unforeseen biases doubtless exist in both the sieved and unsieved

[3] The raw NISP and MNE values from which the figures in Table 5.4 are derived are presented in Appendix A (Table A.5).

assemblages, the two classes of material can be legitimately compared for the purposes of this study.

5.5 Quantification

Faunal remains can be quantified in a number of different ways. As the choice of quantification method can influence the outcome of an analysis, the techniques used must be appropriate to the questions asked. The most basic unit of quantification is NISP, the number of identified specimens. NISP is a count of all specimens; bones, teeth, antler, and fragments thereof which have been identified to a particular taxon. All other quantification units are derived from NISP, and are related to each other and to sample size (Grayson 1978, 1979, 1981, 1984).

The purpose of Chapter 4 was to give a general impression of the range of taxa on each site and their relative importance. NISP was considered sufficient for these purposes. Grayson (1984: 131-151) has illustrated a relationship between sample size and the number of taxa in a given assemblage (Figure 5.13). Initially, the number of identified taxa increases sharply as NISP increases. As the maximum possible number of taxa is approached, the rate of increase in identified taxa slows relative to the increase in total NISP, eventually tapering off to zero, though NISP continues to increase. Thus, the huge range of species identified at sites such as Gressbakken 3, Gressbakken 4 and Bergeby 18 may be partly a product of the large faunal samples from these sites. A much smaller range of species has been identified at sites with smaller NISPs, including the sampled houses at Advik, Kalkillebukta and Høybukt, even though the full range of species observed in the larger samples may also have been present in these middens.

Where a comparison is being made between different parts of the skeleton for a given taxon, NISP is no longer an appropriate measure, since different skeletal elements fragment differently (Lyman 1994: 111). Certain elements, such as vertebrae and ribs, tend to break into a large number of pieces, while other elements, such as carpals, rarely break at all. In order to compensate for this problem, a measure known as MNE, the minimum number of elements, has been developed. MNE is a derived measure and is not without associated problems. It can be calculated based on a number of different criteria, and in each case, a different value will result (e.g. Bunn & Kroll 1986, 1988;

Marean & Spenser 1991; Stiner 1994: 238-240). Criteria such as side, size, state of fusion and sex of the elements in question may or may not be taken into account when calculating MNE. As the number of categories factored into the calculation of MNE increases, MNE approaches NISP (Grayson's 1984: 27-85 discussion of another derived minimum number, the MNI, also applies to MNE). Therefore, MNE must be clearly defined before it is used in any analysis.

For the purposes of this analysis, MNE was calculated using a number of landmarks or "diagnostic zones" defined for each element. For longbones, these zones were generally restricted to the articular ends, though diagnostic foramina and muscle attachments on the shafts were also included. There was no overlap between zones, and a zone was counted if half or more of it was present. MNE was based on the most frequently occurring zone for a given element in a given context, regardless of side or state of fusion. This means that MNE for any element may be based on different zones in different samples. However, in several cases, for example seal crania and reindeer ulna, the same zone was the most frequent in all of the Varanger assemblages (see Tables 5.5 and 5.6). To facilitate a discussion of density-mediated destruction of the seal and reindeer bones from Varangerfjord, MNE for proximal and distal ends of longbones was calculated separately.

While MNE helps to combat the problem of different rates of fragmentation, any comparison of several different skeletal elements must also take into account the differing numbers of each element found in a complete skeleton. Seal thoracic vertebrae, for example, will be greatly over-represented relative to humeri based on the MNE count since there are 15 thoracic vertebrae and only 2 humeri in a seal skeleton. This problem is easily overcome by dividing MNE values for each element by the number of that element in a complete skeleton. The resultant value is known as MAU, minimum animal unit (Binford 1984: 50). In this analysis, in order to reduce the number of calculations required, the MNE values are normed slightly differently to create MAU. Many of the elements in a complete skeleton are paired, and none of the MNE values for paired elements need to be adjusted if MNE values are divided by the number of a particular skeletal element *on one side* of a complete skeleton in order to produce MAU. MNE for seal metatarsals is thus divided by 5, humerus by 1 (so it remains unchanged) and atlas by

½ (or multiplied by 2 for simplicity). Derivation of MAU is presented for seals and reindeer in Tables 5.5 and 5.6 respectively.

Table 5.5 Derivation of MNE and MAU for seal elements

SEAL ELEMENT	MNE COUNT BASED ON (regardless of side or state of fusion)	MAU (derived from MNE)
cranium	½ or more of auditory bulla	x 2
mandible	½ or more of toothrow	÷ 1
atlas	most frequent zone	x 2
axis	most frequent zone	x 2
cervical	½ or more of centrum	÷ 2.5
thoracic	½ or more of centrum	÷ 7.5
lumbar	½ or more of centrum	÷ 2.5
scapula	½ or more of glenoid	÷ 1
proximal humerus	most frequent zone	÷ 1
distal humerus	most frequent zone	÷ 1
proximal radius	½ or more of articular surface	÷ 1
distal radius	most frequent zone	÷ 1
proximal ulna	½ or more of articular surface	÷ 1
distal ulna	complete distal end	÷ 1
metacarpal	number of proximal or distal ends (whichever is greater) for MCI, II, III, IV and V. All summed.	÷ 5
innominate	most frequent zone (acetabulum)	÷ 1
proximal femur	most frequent zone	÷ 1
distal femur	most frequent zone	÷ 1
proximal tibia	most frequent zone	÷ 1
distal tibia	most frequent zone	÷ 1
metatarsal	number of proximal or distal ends (whichever is greater) for MTI, II, III, IV and V. All summed.	÷ 5

Note: Where a particular part of the element is specified, MNE was based on the same zone for all of the Varanger assemblages.

When comparing assemblages of different sizes, MAU values are often standardised to show the relative rather than absolute numbers of each skeletal element. This is done by dividing all MAUs by the largest MAU in the assemblage. The resulting values are known as %MAU (cf. Binford 1978, 1981, 1984). The use of %MAU also eliminates the difference between MAU values derived based on the number of elements in a complete skeleton and those derived based on the number of elements on one side of a skeleton.

Table 5.6 Derivation of MNE and MAU for reindeer elements

REINDEER ELEMENT	MNE COUNT BASED ON (regardless of side or state of fusion)	MAU (derived from MNE)
antler*	½ or more of burr	÷ 1
cranium	occipital condyles	÷ 1
mandible	mental foramen	÷ 1
atlas	most frequent zone	x 2
axis	most frequent zone	x 2
cervical	½ or more of centrum	÷ 2.5
thoracic	½ or more of centrum	÷ 6.5
lumbar	½ or more of centrum	÷ 3
scapula	½ or more of glenoid	÷ 1
proximal humerus	most frequent zone	÷ 1
distal humerus	most frequent zone	÷ 1
proximal radius	most frequent zone	÷ 1
distal radius	most frequent zone	÷ 1
proximal ulna	½ or more of articular surface	÷ 1
proximal metacarpal	most frequent zone	÷ 1
distal metacarpal	most frequent zone	÷ 1
innominate	most frequent zone (acetabulum)	÷ 1
proximal femur	most frequent zone	÷ 1
distal femur	most frequent zone	÷ 1
proximal tibia	most frequent zone	÷ 1
distal tibia	most frequent zone	÷ 1
proximal metatarsal	most frequent zone	÷ 1
distal metatarsal	most frequent zone	÷ 1

Note: Where a particular part of the element is specified, MNE was based on the same zone for all of the Varanger assemblages.

* These MNE and MAU values greatly under-represent the amount of antler in an assemblage because of the difficulty in selecting a non-repeatable zone on which to base the MNE count. A large number of beam and tine fragments could be derived from a single antler, making these fragments unsuitable for calculating MNE. Furthermore, the number of antler tines varies depending on the age and sex of the individual, so tines could never be used to calculate MAU. While burr was used to calculate MNE and MAU, it is unlikely that the small number of burrs present account for the large numbers of beam and tine fragments which were found. Despite this, the antler MNE and MAU counts do not under-represent the number of reindeer carcasses as much as the antler NISP might suggest, since naturally shed antlers are present in the assemblages.

Grayson (1984: 93-115) has argued convincingly that zooarchaeological measures of abundance should be treated as ordinal rather than ratio or interval scale. This means that they rank species and elements according to their importance, but may not accurately reflect the distance between the units on that scale. Thus, in a midden sample containing 500 reindeer bones and 1000 seal bones, it is possible to say that seal bones were more numerous than reindeer bones in the midden. It cannot, however, be said that

they were twice as numerous. The level of measurement is of crucial importance when applying statistical tests to any data, as any tests applied must be appropriate to the level of measurement in question. This explains the wide-spread use of rank-order correlation coefficients, such as Spearman's rho, in zooarchaeology.

5.6 Conclusion: Limits and potential of the Varanger assemblages

Preservation conditions and the resulting level of bone preservation were very similar on all of the Varangerfjord sites. Fortunately for the purposes of this analysis, most of the bone was in excellent condition when it was excavated. It displayed little carnivore damage, minimal weathering and a low degree of fragmentation. As a result, a large proportion of each assemblage could be identified to element and taxon.

Many taphonomic sources of bias have been discussed in this chapter, and those introduced by sieving techniques (or the lack thereof) are potentially the most serious. A detailed comparison of the relative importance of different taxa on each site might reflect more about recovery during excavation than about resource exploitation in the past. The analysis presented in the following chapters will avoid the problem by concentrating on two groups of large-bodied mammals, seals and reindeer. Both demonstrate comparable recovery in sieved and unsieved assemblages from Varanger.

CHAPTER 6

SPRING DAWNS: SEAL HUNTING IN VARANGER

6.1 Introduction

The large numbers of seal bones recovered in the midden features around Varangerfjord provide a unique opportunity to examine the hunting behaviour of the human occupants of the area 4000 years ago. Similarities and differences in seal hunting practices at each house have the potential to reveal social distinctions or seasonal and functional differences between houses. Håkon Olsen's (n.d.) analysis of the faunal remains indicated the importance of seal, particularly harp seal, relative to other mammals in Varanger as a whole. However, it neither explored the patterns of seal exploitation at individual houses, nor examined the hunting strategies applied to different seal species.

H. Olsen identified all of the sea mammal bones at sites with smaller faunal assemblages, including Advik and Høybukt. However, at Gressbakken, where the assemblages were much larger, the sea mammals were identified to species only at House 4. As part of this investigation, all seal bones from Gressbakken 3, Gressbakken 5 and Gressbakken 23 were identified for the first time. Seal material from Gressbakken 4 was also re-examined and measured, along with that from Bergeby 18, Karlebotnbakken and Kalkillebukta which was originally identified by Anne Karin Hufthammer and Pirjo Lahtiperä of the Zoological Museum in Bergen. Post-cranial seal remains are notoriously difficult to identify to the species level because of the considerable morphological variation within each species, and the many similarities between species. An important part of this analysis has been to develop a manual for the identification of post-cranial seal elements (Appendix B). The use of this manual permitted a more specific identification of many of the bones classed only as "Phocid" by Olsen, Hufthammer and Lahtiperä. It also revealed a number of incorrectly identified bones among the seal material, as well as specimens identified to species when a more general category would have been appropriate. This is not to undermine the quality of Olsen, Hufthammer and Lahtiperä's work All are experienced faunal analysts familiar with a wide range of material. It merely highlights the difficulties involved in identifying seal

bones and emphasises the need for special attention, an extensive comparative collection and a fairly specialised knowledge of seal skeletal morphology.

The newly identified seal material and a close examination of the previously identified bones provide the starting point for an in depth analysis of seal hunting at the Varanger sites. Five seal species are found in the YSA middens, and their remains demonstrate both the intensity and season of the seal hunt at that time. Their bones also suggest the hunting methods used to acquire different seal species and the factors influencing prey selection by human hunters. This chapter will attempt to establish a pattern of seal hunting behaviour for each of the houses in the study sample. Similarities and differences in these patterns will be explored, as will their implications in terms of functional and social organisation within late Younger Stone Age human communities.

6.2 The seal species of Varanger

Five species of seal currently frequent the waters of Varangerfjord; harp seal (*Phoca groenlandica*), ringed seal (*Phoca hispida*), harbour seal (*Phoca vitulina*), grey seal (*Halichoerus grypus*) and bearded seal (*Erignathus barbatus*). All are found in the Gressbakken period house middens, though harp seal and ringed seal far outnumber the other species. A single hooded seal (*Cystophora cristata*) cranial fragment has also been identified in the material from the north-east midden at Gressbakken 5. Hooded seals live today amongst the thick drift ice in the deep offshore waters of the North Atlantic (Nowak 1991) and rarely visit the Norwegian coast (Wollebæk 1927). It is unlikely that they preferred shallower inshore waters during the Younger Stone Age. The single bone probably represents the rare appearance of an individual in Varanger, possibly an animal swept off course during a storm.

6.2.1 Harp seal (*Phoca groenlandica*)

Harp seal is by far the most common seal species in the Varanger assemblages. Today, large numbers of this species migrate into the fjord every spring. There are three modern breeding populations of harp seal in the world's oceans, one in the Northwest Atlantic, a second in the Greenland Sea and a third in the White Sea (King 1983; Maxwell 1967; Ronald & Dougan 1982). Those that visit the northern coast of Norway are from the White Sea population. Harp seals are dependent on large ice floes for

breeding and moulting, and often feed in or near the pack ice (Nowak 1991). They are a gregarious species, forming large groups to hunt fish and gathering in the tens of thousands during the spring moult (King 1983). Births occur on the ice in the White Sea between January and early April, with a peak between late February and mid-March (Maxwell 1967). Lactation lasts 10-12 days, and females come into oestrus and mate just prior to weaning (King 1983). A migration to the moulting rookeries follows, where moulting begins towards the end of April (Markussen 1990; Maxwell 1967). After the moult, the White sea population move north and east into their summer feeding grounds before returning to give birth and mate again in January (Maxwell 1967; Nowak 1991). During whelping, mating and moulting, the seals haul out on the ice and do not feed.

The first harp seals generally appear in Varangerfjord in late winter (February-March), at which time the flocks generally consist of immature animals, though some adults, particularly males, are also present. Adult harp seals move into Varanger in the largest numbers in March and April, in between the whelping/mating season and the annual moult, at which time they are approaching their lowest body weight of the year (Figure 6.1), which makes them relatively easy to hunt. Pups born that year usually arrive somewhat later (Bjørn Bergflødt, pers. comm.). Most harp seals have left the area again by the end of June, though some groups may remain in Finnmark for the rest of the summer, and occasional stragglers spend the entire year in the area (Collett 1912; Haug *et al.* 1994).

In some years, there is a harp seal "invasion" of the Norwegian coast. During such years, often characterised by unusually cold temperatures in the Barents Sea, the animals appear along Norway's northern coast in far greater numbers than usual and range much farther south than during normal years. During the 1902-3 invasion, large numbers were recorded as far south as the Skaggerak, which separates Norway from Denmark (Markussen 1990). Harp seals also invaded in 1987-88, at which time over 60,000 individuals died and most of the population was noted to be underweight, suggesting that these forays beyond the usual southern limits of their terrain involve a search for food (Markussen 1990). Under normal conditions, the average weight of an adult is approximately 150 kg, though this fluctuates throughout the year (see Figure 6.1). An average adult harp seal is 2.2 m long, with females only slightly smaller than males

(Markussen 1990; Maxwell 1967). Pups weigh roughly 12 kg and are around 65 cm long at birth (Maxwell 1967).

6.2.2 Ringed seal (*Phoca hispida*)

The second most important seal species in Varanger, the ringed seal, is essentially a coastal species and does not disperse very far offshore (Maxwell 1967). Ringed seals are relatively solitary creatures capable of maintaining breathing holes in landfast ice (McLaren 1962; Wollebæk 1927). They are found in seasonally or permanently ice-covered waters where their movements are dictated by the advance and retreat of the ice (Nowak 1991). The highest densities of breeding adults are found on, or under, stable land-fast ice (King 1983). The ringed seal population along the North Norwegian coast is comprised predominantly of juvenile individuals (Bjørn Bergflødt, pers. comm.), large numbers of which are often found in the region during the spring cod season (Wollebæk 1927). Ringed seal are to be found in Varangerfjord in the largest numbers in winter and early spring, and prefer the shore-fast ice of the inner fjord. When the ice disappears in early May, they move off to the north and east towards the pack ice (Bjørn Bergflødt, pers. comm.).

Ringed seal females give birth in late March or early April on top of the shore-fast ice (McLaren 1962; Wollebæk 1927). The number of pups is limited by the amount and quality of landfast ice, with the thick fixed ice of complex coasts making the best birthing location (McLaren 1962). Ringed seals fast during the whelping/mating season and during the late June-early July moult, and their body fat levels vary accordingly throughout the year. During the winter, approximately 40% of the weight of an individual is blubber, while this figure is reduced to around 23% in the summer (McLaren 1962). Ringed seals are the smallest of the Norwegian seals, rarely reaching more than 1.5 m in length (Maxwell 1967; Wollebæk 1927), with adults averaging about 70 kg (McLaren 1962). As with the harp seal, there is little sexual dimorphism, and females are only slightly smaller on average than males (Maxwell 1967).

6.2.3 Harbour seal (*Phoca vitulina*)

The harbour seal, also known as the common seal or the spotted seal, is not associated with ice like the other northern phocids. It lives along shorelines and in estuaries, occasionally swimming far upstream in rivers, and often pulls out on beaches, sandbanks,

reefs and tidal rocks (King 1983). The species is not migratory, but local movements occur in association with tides, reproduction and the availability of food (Bigg 1969). While harbour seals occur along the entire length of the Norwegian coast, they are found in the largest numbers in the south and south-west (Wollebæk 1927). A small population is found in the Varangerfjord year-round (Bjørn Bergflødt, pers. comm.).

Harbour seals are generally solitary in the water, but may form small groups at favoured haul-outs (Bigg 1969; Fisher 1952; Nowak 1991). Along Norway's arctic coast, births peak in June and July, and lactation lasts 3-6 weeks (King 1983). Mating occurs shortly after the young are weaned (Bigg & Fisher 1974). Harbour seals are larger than ringed seals in terms of body length, but weigh approximately the same. Adult males can reach 1.7 m long and average 87 kg, while adult females reach up to 1.4 m long and average 65 kg (Bryden 1972; Maxwell 1967). Adult harbour seals are extremely wary both on land and in the water (Fisher 1952; Maxwell 1967), making them difficult prey for human hunters.

6.2.4 Grey seal (*Halichoerus grypus*)

Grey seals, like harbour seals, are non-migratory coastal seals. In Norway, Grey seals are found in large colonies around Trondheimsfjord and in a few localities further north along the coast (Wollebæk 1927). This is primarily a boreal species, and Varangerfjord is located near the northernmost limits of its range. However, there are regular sightings of these seals in the area throughout the year, and breeding populations have been occasionally reported in the fjord (Collett 1912). When breeding, grey seals come on shore in large groups, either on rocky coasts or small offshore islands (King 1983). In Norway, breeding occurs from September to December, with births peaking in November (Wollebæk 1927). Lactation lasts around three weeks and mating occurs immediately afterwards. Large groups also form during the moult, generally from April to May (Nowak 1991). Grey seals show marked sexual dimorphism, with the males averaging 1.95 to 2.3 m long and weighing 170 to 310 kg. Females are considerably smaller, reaching between 1.65 and 1.95 m in length and weighing from 105 to 186 kg (Nowak 1991).

6.2.5 Bearded seal (*Erignathus barbatus*)

Bearded seals formerly occurred in large numbers along the Norwegian coast as far south as Trondheim, but today are only occasional visitors to the area (Smit & Wijngaarden 1981). When they are present in Varangerfjord and the other fjords of Finnmark, they can be seen throughout the year (Ognev 1935). They do not migrate, and are generally solitary animals, though aggregations can occur at good pull-out areas (Nowak 1991). Bearded seals cannot maintain breathing holes in fixed ice and prefer areas where the ice is in constant motion and has many natural openings (Nowak 1991). Spending much of the year in the shallow open waters near coastlines, they breed on ice floes near the coast (McLaren 1962). Pups are born between mid-March and mid-May, and mating follows (Nowak 1991). Males and females are approximately the same size, ranging between 2 and 2.6 m long, and weighing 200 to 360 kg (Nowak 1991).

6.3 The identification of seal bones from archaeological sites

The bone morphology of phocid seals shows a great deal of variation between individuals of a given species and strong similarities between different species, which makes species identification difficult. Parts of the skull, particularly the auditory bulla, maxilla and mandible are distinct for each species, as is the humerus (Amorosi 1992). In many cases, these are the only bones identified by zooarchaeologists to the species level (e.g. Møhl 1986). Seal crania tend to be well represented on archaeological sites, so this level of analysis allows a very general assessment of the relative proportions of different seal species on a site. However, the failure to identify the majority of post-cranial elements to species means that important information, such as bone fusion, which can shed light on the age breakdown of the different seal populations, goes untapped.

As part of this analysis, the extensive reference collection of phocid seals at the Zoological Museum in Bergen, Norway was used to create a manual for the identification of post-cranial elements of North Atlantic phocid seals (Appendix B). The manual is the first of its kind to deal so extensively with the post-cranial skeleton and distinguishes between adults and juveniles of each species based on morphological traits. The largest possible number of skeletons were examined in its compilation since many distinguishing traits are not universal. For example, a trait which clearly separates ringed seal *a* and harbour seal *b*, can be identical in ringed seal *x* and harbour seal *y*. Some of

the morphological traits described in the manual reliably distinguish between the six species (hooded seal is included) in almost every case. Others are only effective for the extremes of variation within each species. For example, the width and curvature of the radius shaft can be used to identify more gracile ringed seal individuals, while a more robust ringed seal radius would be indistinguishable from a gracile harbour seal one. Still other traits can be used to rule out several species without allowing a positive identification. The traits illustrated in Appendix B were used to identify all of the seal remains from Varanger. This permits a more reliable discussion of the relative importance of different seal species at each house than if only the cranial elements had been identified.

6.4 General trends in seal species representation

The relative proportions of the different seal species at each of the late Younger Stone Age houses in Varanger are presented in Table 6.1. Where there are more than 100 identified specimens in each of the middens from a given house, the middens are presented separately, otherwise they are presented together. Harp seal is the most common species in all but the north-west midden at Gressbakken 5, where it is outnumbered by ringed seal. Ringed seal is otherwise the second most common species at all of the Varanger sites. Together, harp seal and ringed seal account for most of the positively identified seal bone in the assemblages. Harbour seal, grey seal and bearded seal make small contributions which vary in importance from site to site.

There are also relatively large numbers of bones assigned to the "large phocid" and "small phocid" categories. "Large phocid" applies to bones and, more often, fragments that could belong to either harp seal, grey seal, bearded seal or hooded seal. In most cases bearded seal can be ruled out because of its large size and distinct morphology. Hooded seal is harder to rule out morphologically but is extremely unlikely since the Varangerfjord lies outside its normal range. Given the scarcity of the other large phocids in the identified material from Varanger, most of the large phocid bones in the assemblage are probably harp seal. The "small phocid" label is applied to any ringed seal- or harbour seal-sized bone which could not be positively identified to species. The two species are often difficult to distinguish from one another, which means that the number of small phocids tends to be larger relative to identified ringed and harbour seal than the number of large phocids relative to identified harp and other large seals.

Table 6.1 Distribution of seal species at Gressbakken-type houses around Varangerfjord
Site abbreviations: **BE** Bergeby **GB** Gressbakken

	BE 18 SE ALL LEVELS		**BE 18 SW ALL LEVELS**		**BE 18 SE Level 2**		**BE 18 SE Level 3**		**BE 18 SW Level 2**		**BE 18 SW Level 3**		**BE Level 2 TOTAL**		**BE Level 3 TOTAL**	
	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL
Harp seal	148	88.1	101	66.4	26	86.7	107	93.9	33	51.6	67	77.0	59	62.1	174	86.6
Ringed seal	6	3.6	24	15.8	4	12.9	1	0.9	20	31.3	4	4.6	24	25.3	5	2.5
Harbour seal	0	0	1	0.7	0	0	0	0	1	1.6	0	0	1	1.1	0	0
Grey seal	1	0.6	1	0.7	0	0	0	0	0	0	1	1.1	0	0	1	0.5
Bearded seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Phocid	11	6.5	20	13.2	1	3.2	6	5.3	7	10.9	13	14.9	8	8.4	19	9.5
Small Phocid	2	1.2	5	3.3	0	0	0	0	3	4.7	2	2.3	3	3.2	2	1.0
TOTAL ID'd	**168**		**152**		**31**		**114**		**64**		**87**		**95**		**201**	
Phocidae	1414		1221		294		1061		447		774		541		1835	
GRAND TOTAL	**1582**		**1373**		**325**		**1175**		**512**		**851**		**637**		**2036**	

	GB 3 NE		**GB 3 NW**		**GB 4 NE**		**GB 4 NW**		**GB 5 NE**		**GB 5 NW**		**GB 23**	
	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL
Harp seal	106	41.7	263	41.6	102	36.7	165	43.0	71	32.1	51	24.5	24	33.8
Ringed seal	52	20.5	81	12.8	47	16.9	58	15.1	39	17.6	68	32.7	13	18.3
Harbour seal	5	2.0	11	1.7	9	3.2	13	3.4	2	0.9	2	1.0	2	2.8
Grey seal	0	0.0	15	2.4	0	0	3	0.8	1	0.5	4	1.9	1	1.4
Bearded seal	17	6.7	31	4.9	26	9.4	20	5.2	7	3.2	1	0.5	6	8.5
Hooded seal	0	0	0	0	0	0	0	0	1	0.5	0	0	0	0
Large Phocid	26	10.2	89	14.1	28	10.1	50	13.0	51	23.1	15	7.2	15	21.1
Small Phocid	48	18.9	142	22.5	66	23.7	75	19.5	49	22.2	67	32.2	10	14.1
TOTAL ID'd	**254**		**632**		**278**		**384**		**221**		**208**		**71**	
Phocidae	1699		2991		2154		2352		772		1001		381	
GRAND TOTAL	**1953**		**3623**		**2432**		**2736**		**993**		**1209**		**452**	

Table 6.1 continued
Site abbreviations: **KB** Karlebotnbakken **AD** Advik **KK** Kalkillebukta **HB** Høybukt

	KB		**AD B**		**AD J**		**KK 17**		**HB 2**		**HB 4**	
	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL	NISP	% ID'd SEAL
Harp seal	126	72.4	45	56.3	3	16.7	14	70.0	7	77.8	18	51.4
Ringed seal	8	4.6	11	13.8	13	72.2	3	15.0	1	11.1	2	5.7
Harbour seal	2	1.1	0	0	0	0	1	5.0	0	0	2	5.7
Grey seal	4	2.3	0	0	0	0	0	0	0	0	0	0.0
Bearded seal	0	0	1	1.3	1	5.6	1	5.0	0	0	1	2.9
Large Phocid	30	17.2	19	23.8	0	0	0	0	0	0	5	14.3
Small Phocid	4	2.3	4	5.0	1	5.6	1	5.0	1	11.1	7	20.0
TOTAL ID'd	**174**		**80**		**18**		**20**		**9**		**35**	
Phocidae	1034		285		27		126		152		320	
GRAND TOTAL	**1208**		**365**		**45**		**146**		**161**		**355**	

Positively identified ringed seal bones outnumber harbour seal by at least four times at the sites in question, often far more. This suggests that most of the small phocid bones are probably ringed seal.

6.4.1 Relative importance of seal species at each house

Figure 6.2 is a graphical presentation of the relative importance of the different seal species at each of the Varanger sites. The values for harp seal here include the large phocid category and those for ringed seal the small phocid category. While this may slightly inflate the importance of both ringed and to a lesser extent harp seal, failing to include these numbers would result in a far more serious under-estimation of the number of ringed and harp seals.

The seal species distributions fall into three groups of sites. The first group includes all three houses from Gressbakken Nedre Vest and House 23 from Gressbakken Nedre Øst (Figure 6.2a-g). These houses have the largest amounts of ringed seal in Varanger, ranging from 32% to 56% of the identified seal bone. Harp seal is generally the most important seal species in this group, ranging between 47% and 56% of all identified seal, but it is less numerous than in the other two groups. In the north-west midden at Gressbakken House 5, ringed seal form 64% of the identified seal bones and outnumber harp seal (Figure 6.2f). This assemblage contains the highest percentage of ringed seal among all the middens in question. At almost all of the Gressbakken middens, bearded seal ranks third after harp seal and ringed seal, ranging normally between 5% and 8% of the identified seal bone. Gressbakken 5 NW is again an exception to the rule, with only 0.5%, and the north-east midden at House 5 also has somewhat fewer bearded seal than average at 3%. Harbour seal, grey seal and hooded seal each comprise between zero and three percent of the Gressbakken assemblages.

The second group of sites, consisting of Kalkillebukta 17, Høybukt 2 and Høybukt 4 (Figure 6.2 h-j) have noticeably more harp seal and less ringed seal than the Gressbakken assemblages. All three of these samples are small (the largest, Høybukt 2 has an NISP of 58) and the percentages may therefore not be as reliable as those for middens with over 100 specimens. Grey seal is not represented at any of these houses, which is probably

related to sample size rather than a complete absence of the species. Grayson (1984: 132-151) has shown that there is a strong positive correlation between NISP and the number of species identified in a faunal assemblage. The larger the assemblage, the more likely that rarer species will be included in the sample. Nonetheless, harbour seal is present in small amounts (2-6% of identified seal) at all three sites, and bearded seal is present at both Høybukt 4 and Kalkillebukta 17 (3% and 5% respectively).

The final group of sites, characterised by very large amounts of harp seal and unusually small amounts of ringed seal, includes Bergeby 18, Karlebotnbakken and Advik B (Figure 6.2 k-p). Data from Bergeby 18 is presented for all levels in each midden, and also for levels 2 and 3. This is the only site where the stratigraphy, excavation strategy and size of the faunal assemblage permit a division of the faunal material into distinct stratigraphic units. The ringed seal values for the south-western midden (all levels combined; Figure 6.2 l) and for level 2 (middens combined; Figure 6.2 m) are inflated by the large numbers of ringed seal in level 2 of the south-west midden (see Table 6.1). Ringed seal and small phocid make up a much larger percentage of the identified seal remains from this context than from any other. This anomalous assemblage from level 2 south-west may be partly attributable to a dump of bone from an isolated ringed seal hunting episode. Alternatively, the values may represent a statistical anomaly. Only 65 seal bone were identified from level 2 of the south-west midden, and the sample may not be representative. Whatever the reason, the assemblage deviates from the norm on the site. Typical hunting patterns at Bergeby 18 are probably better represented by the values for the south-east midden (Figure 6.2 k) and for level 3 (Figure 6.2 n).

Small amounts of grey seal (1-2%) are found in both of the middens at Bergeby 18 and at Karlebotnbakken. Similar amounts of harbour seal (roughly 1% of identified seal) are present at both the south-west midden at Bergeby 18 and at Karlebotnbakken. Bearded seal is found only at Advik B where it makes up just over 1% of the identified seal remains. Like Gressbakken 23, Kalkillebukta 17 and Høybukt 2 and 4, Advik B has a relatively small sample of identified seal bones The relative percentages of seal species from these sites may not be entirely reliable, particularly where poorly represented species are concerned. The presence of a few harbour or grey seal bones at Advik B would place it more within the middle group of sites (Figure 6.2h-j) than the Bergeby and Karlebotnbakken group.

The three groups described above can be defined based on the importance of harp seal in the identified seal material. Assemblages in the first group contain less than 57% harp seal, those in the second group contain 65-70% harp seal, and those belonging to the third group contain over 78% harp seal. Given the uncertainty associated with samples of less than 100 seal specimens, Gressbakken 23, Kalkillebukta 17, Høybukt 2, Høybukt 4 and Advik B, will be excluded from the following discussion. This leaves only the two extremes in terms of seal species representation. At one extreme are Gressbakken 3, 4, and 5, with 32-56% harp seal, and 35-65% ringed seal, at the other are Bergeby 18 and Karlebotnbakken with considerably more harp seal (79-94%) and less ringed seal (5-19%). As discussed above, Bergeby 18 Level 2 does not fall into this pattern, but is not reflective of the overall trend at the site. The importance of harp seal in Bergeby 18 SW (as shown in Figure 6.2 l) becomes even more pronounced if level 2 is excluded, rising to 91% of the identified seal while ringed seal falls to 7%. Thus, if the anomalous values from Bergeby 18 (south-west midden level 2) are excluded, the range of harp seal at the second extreme becomes 91-94% and that of ringed seal 5-7%.

These differences may be partly explained by local variation in the availability of ringed seals near these sites. Ringed seals tend to prefer the thicker land-fast ice associated with complex coastlines, particularly during whelping (McLaren 1962). Four thousand years ago, the southern coast of Varanger was more convoluted, with more small bays and islands than the north coast (Figure 2.3). The geography around Gressbakken would have created very attractive ice conditions for ringed seal. The simpler coastlines of the north shore around Bergeby and of innermost Varangerfjord near Karlebotn would have provided less suitable habitat for ringed seals.

These differences could also relate to seasonal activity at the sites. For example, Karlebotnbakken and Bergeby 18 might have been occupied only during the spring harp seal migration. In addition to this spring occupation, the houses at Gressbakken might also have been inhabited throughout the winter, at which time ringed seal were hunted. Alternatively, all the sites might have been occupied year-round, with the occupants of Karlebotnbakken and Bergeby 18 hunting seals only in spring, while those at Gressbakken Nedre Vest hunted seals whenever they were available. Such behaviour might have related to a local preference for ringed seal at Gressbakken Nedre Vest. In

the following sections, determination of both the season in which harp and ringed seals were hunted at each house and the age breakdown of the prey populations will help to evaluate these suggestions.

6.5 The Harp seal hunt

What time of year were harp seals hunted in Varangerfjord 4000 years ago? How old were the individual seals hunted by the YSA occupants of the fjord? Tooth sections, long bone shaft measurements and bone fusion can all help to provide answers to these questions.

6.5.1 Tooth sections

Harp seals are today found in the Varangerfjord in large numbers only during the spring migration, though occasionally some individuals remain throughout the year (Collett 1912; Haug *et al.* 1994). Thin sections of a sample of harp seal canine teeth from Gressbakken Nedre Vest suggest that they followed the same seasonal pattern of movement into Varanger 4000 years ago (Hodgetts & Bergflødt, forthcoming).

Dental annuli, the annual growth layers in mammalian teeth, allow the determination of both the age of an animal at death and the approximate season of death, both of which are valuable to zooarchaeologists studying the hunting patterns of past human populations (Monks 1971; Spiess 1976; Weber *et al.* 1993, 1998). The rate of growth of mammalian teeth is not constant throughout their lifetime, but fluctuates during the annual physiological cycle. These yearly changes in the rate of deposition of dentine and/or cementum lead to the production of concentric rings known as Incremental Growth Layers (IGL) which repeat cyclically, forming a new Growth Layer Group (GLG) each year (Weber *et al.* 1993). The use of tooth sections to determine the age at death of seals was pioneered by Scheffer (1950) and Laws (1952, 1962) and has since been used in a number of studies of harp seal ecology (Bowen *et al.* 1983; Lydersen *et al.* 1991; Nilssen *et al.* 1996).

IGLs are clearly visible in the dentine of both upper and lower canines of harp seals, and also in the cementum of upper canines. However, in seals, canine dentine provides the most accurate indicator of age (Bowen *at al.* 1983; Klevezal 1988; Scheffer & Myrick

1980). Thin translucent bands visible in the sections correspond to the fasting period during the annual spring moult, while the wider opaque bands are produced during the rest of the year (Bowen *et al.* 1983). The age of an individual is determined by counting the number of GLGs produced in the course of its life. Determination of season of death involves comparing the development of the most recent (innermost) band with that from a reference collection with known dates of death (Weber *et al.* 1993).

Table 6.2 Age at death indicated by Harp seal canine sections at Gressbakken Nedre Vest

	Age	# of sections House 3	# of sections House 4	# of sections House 5
Pup	0 (1-3 months)	1	1	4
Juvenile	1	3	1	3
(not sexually mature,	2	5	2	2
hasn't attained full	3	3	6	1
body size)	4	3		
Sexually mature adult	5	4		
	6		1	
	7		3	
	8			
	9	1	2	1
	10			
	11		2	1
	12	1		
	12+		3	
	13			
	14	1		
	14+	1	1	1
	15	1		
	15+	1		
	16	1	1	
	17	1		1
	18	1		
	19	2		
	19+	2		2
	20	1		
	21		2	
	21+	2		
	22	1	1	
	22+	2		
	23+	1		
	24	2		
	25	1		
	26			
	27+	2		
	28			
	29+	1		
	30+	1		
	Total	46	26	16

note: + indicates a minimum age determination

A total of 98 harp seal canine teeth were recovered in the middens at Gressbakken Houses 3, 4, and 5, most of them in excellent condition despite their age. The teeth were sectioned transversely at the widest point of the root using two parallel circular saw blades, approximately 0.15 mm apart. The sections were mounted on slides and read at a magnification of 25x under polarised transmitted light. Of the 98 canines, 88 produced readable sections, while the remaining ten were either too fragile to be sectioned successfully, or too eroded to be read once they were sectioned. The mounted sections are now housed in the osteology section of the Zoological Museum in Bergen.

Age was recorded based on a count of the number of opaque layers deposited after the neo-natal line (produced during the brief starvation period after weaning). For younger individuals, generally less than ten years old, a record was also made of the stage of development of the most recent growth layer. The season of death was then estimated using comparative material in the collections of the *Havforskningsinstitut* (Marine Research Institute) in Bergen. In older animals, the root cavity begins to fill in and the growth layers are so close together that it is difficult to assess the development of the innermost one.

A wide range of ages is represented by the harp seal teeth from all three house features at Gressbakken Nedre Vest (Table 6.2). Pups under one year, probably only a few months old, are found alongside individuals that were over twenty years old. For some of the older adults the annuli were extremely close together and only a minimum age could be determined, as indicated by a plus sign (+). Among the younger individuals where the season of death could be established, 28 out of 39 displayed a well developed opaque band, corresponding to the period just before moulting (Table 6.3). Eight individuals were developing a translucent band, indicating that they were in the process of moulting, and a further three had just begun to develop a new opaque band, indicating that they had resumed feeding after the moult and were killed in the summer. None of the tooth sections displayed the intermediate development of an opaque band which would indicate death in autumn or early to mid-winter. The table does not include individuals less than one year old because the alternation of opaque and translucent bands is affected by weaning. Moreover, in their first year, pups do not moult at the same time as adults. Although they are not included in the table, six young pups were

represented among the tooth sections. All had a narrow opaque zone after the weaning line, suggesting that they were under three months old.

Table 6.3 Season of death as indicated by most recent growth layer in harp seal canine sections from Gressbakken Nedre Vest

Dentinal development	Corresponding physiological stage	Season it presently occurs	House	Number of individuals
Fully developed translucent band	Whelping season, approaching moult	Late February to early March	3 4 5	14 9 5
				Total 28
Developing opaque band	Moulting season	Late April to early June	3 4 5	2 5 1
				Total 8
Slightly developed translucent band	Shortly after moult, feeding has resumed	Summer	3 4 5	1 1 1
				Total 3
Medium translucent band		Autumn to mid-winter		**Total** 0

Figure 6.3a illustrates the most common stage of dentinal development found among the tooth sections. The opaque bands produced when the animal is feeding appear light under the microscope, while the translucent ones produced during fasting are dark. In the figure, the most recent band appears as a thick light-coloured ring closest to the centre of the tooth. This stage of development is comparable to that from a harp seal killed in mid-May in the Greenland Sea (Figure 6.3b), which had completed whelping and not yet begun to moult[1].

6.5.2 Season

The canine sections from Gressbakken indicate that most harp seals were killed in the spring. This requires the assumption that there have been no major changes in the annual physiological cycle of the White Sea harp seal population over the past 4000 years. Such a change is unlikely, since all modern harp seal populations world-wide breed within a

month of each other, despite geographical and climatic differences (Ridgway & Harrison 1981). Most of the animals were certainly killed after whelping and before moulting; the same stage of their physiological cycle in which they are most numerous in Varangerfjord today. This seasonal kill pattern might be explained by the seasonal hunting of a year-round resource at Gressbakken, whether from year-round dwelling sites or dwellings occupied only in spring to pursue seal and cod. However, a more likely explanation is that harp seal were only available seasonally, when they migrated through the fjord in spring and early summer.

6.5.3 Long bone shaft measurements and timing of the harp seal hunt

In species where all births are clustered at the same time of year, there will be age cohorts within the population that are at similar stages of development. For example, reindeer calves are generally born between mid-May and early June (Spiess 1979), so that by August calves born that year are 2 months old, the previous year's calves are 14 months old and those from the year before that are 26 months old. Until animals reach their full size, it is possible to distinguish one year's cohort from another based on their relative size. If the animals were hunted seasonally, there would be discrete clusters in the size of younger individuals, a "snapshot" of the population at a moment in time. Whereas if they were hunted year-round, there would be a continuous distribution in animal size, since younger individuals would be represented at all stages of development.

Zooarchaeologists have taken advantage of this phenomenon in several different mammalian species in order to determine the season of death. Krause (1937) and Kollau (1943) were the first to use bone growth in this way, studying length distributions of reindeer (*Rangifer tarandus*) longbones to determine the season of occupation of Palaeolithic and Mesolithic sites in Germany. Legge and Rowley-Conwy (1987) have subsequently used gazelle (*Gazella subgutturosa*) longbone width to assess the seasonality of Syrian Stone Age sites. Rowley-Conwy (1993, 1998) has also used scapula, humerus shaft, and phalanx shaft measurements in wild boar (*Sus scrofa*) to demonstrate the seasonality of Scandinavian Mesolithic sites. Woodborne *et al.* (1995) measured Cape fur seal (*Arctocephalus pusillus*)mandibles from coastal Holocene sites

[1] Harp seals in the Greenland Sea whelp and moult approximately one month later than the White Sea population, i.e. in early April and June-July respectively (Bjørn Bergflødt pers. comm.)

in South Africa in order to establish the age structure of the fur seal population and thereby the season of occupation at each site.

Jan Storå (1994)was the first to apply the technique to harp seals, using long bone shaft measurements to determine the seasonality of harp seal hunting at the Stone Age site of Jettböle in Sweden. The method which he developed can also be used to discuss the season of the harp seal hunt and the age breakdown of the hunted harp seal population in Varanger (Hodgetts in press). Storå took a series of measurements on the longbones and auditory bullae of 38 harp seal skeletons housed in the reference collections of the Natural History Museum (*Naturhistoriska Riksmuseet* or NRM) in Stockholm. The collection consists of individuals collected in Tromsø, Norway in January 1987 during the harp seal "invasion" discussed above (section 6.2.1). All were caught accidentally in fishing nets.

In a sample taken over such a limited period of the year, the obvious size difference between individuals in their first year of life (roughly 9 months old in January) and individuals in their second year (roughly 21 months old) should be reflected in a gap in the bone measurement distributions. This is exactly what Storå's measurements show, particularly the longbone lengths. However, length is often impossible to measure in archaeological contexts, due to bone breakage, and shaft measurements are preferable. Shaft measurements also permit the size of unfused bones to be compared with fused bones, even when the unfused epiphyses are missing. The following discussion will therefore be constrained to the two longbones for which Storå (1994: 13-20) demonstrated a good separation between age classes based on diaphysis measurements; humerus and femur. These measurements are defined in Figure 6.4 and their distributions in the NRM sample are plotted in Figure 6.5.

All of the humerus and femur shaft measurement distributions from Varanger reflect the seasonal nature of the harp seal hunt. The data from both middens at each house and from all levels at Bergeby display the same trends, so each house will be presented as a single unit in the following discussion. At Gressbakken 3, 4, and 5, Karlebotnbakken and Bergeby 18, there is a break in the humerus measurement distribution at a shaft width of approximately 2.4 cm and a breadth of 1.7 cm (Figures 6.6 and 6.7). This gap is highlighted by a dotted line which is located in the same place in Figures 6.6 through

6.8. Gressbakken 23, Advik B, Høybukt 2, Høybukt 4, and Bugøyfjord 5 each have only small numbers of measurable harp seal humeri, but none falls within the gap (Figure 6.8). The break in the humerus measurements from the NRM reference seals is less pronounced due to the fact that the NRM pups were older and closer to their adult size than those in Varanger, an obvious consequence of a winter as opposed to a spring kill.

Femur shaft measurements also display a break in their distribution at all of the Varanger sites. This gap occurs at a shaft width of roughly 2.2 cm and a breadth of 1.0 cm at Gressbakken 3, 4, and 5, Karlebotnbakken and Bergeby 18 (Figures 6.9 and 6.10). The gap is again marked by a dotted line which is in the same position in Figures 6.9 through 6.11. Single measurable femora were also recovered at Advik B and Høybukt 2 (Figure 6.11). That from Advik B is obviously an older adult, but the one from Høybukt 2 falls directly within the gap observed at the other sites. This might represent a straggler that over-wintered in Varanger, a grey seal bone mistakenly identified as harp seal, or a measurement recording error. Whatever the explanation, it does little to weaken the strong seasonal marker visible in all the other lines of evidence. The gap in the NRM measurements occurs slightly higher and farther to the right than in the Varanger distributions, again because the NRM pups are roughly nine months older than those in Varangerfjord.

In all cases, the lower end of the size range for humeri and femora in the Varanger assemblages extends below that of the modern NRM sample. This is easily explained by the younger age of the Varanger pups. Among the adults, the Varangerfjord samples span the same size range as the modern reference collection, indicating that there has been no obvious change in the body size of the White Sea harp seal population since 4000 BP. Conversely, Storå (1994) found that archaeological seal bones from Baltic Sea contexts dating to roughly 2500 cal BC were noticeably smaller than the modern NRM sample. The Baltic is no longer home to a harp seal population, but the smaller size of the animals that were hunted there 4500 years ago suggests that they formed a separate breeding population from their contemporaries in Northern Norway.

6.5.4 Measurements and population structure

The humerus and femur shaft widths do more than just indicate the seasonal nature of the harp seal hunt in the Varangerfjord, they also reveal something of the age structure

of the hunted population. At Gressbakken 3, Gressbakken 4 and Karlebotnbakken, pups are greatly outnumbered by adults. Among the humerus shaft measurements, pups (found to the left of the "winter gap" in the measurements) make up 34% of the specimens at Gressbakken 3, 31% at Gressbakken 4, and only 18% at Karlebotnbakken (Figure 6.6). Among the measurable femur shafts, pups constitute 30% at Gressbakken 3, 13% at Gressbakken 4, and 20% at Karlebotnbakken (Figure 6.9). At Gressbakken 5 and Bergeby 18 pups and adults are more equally represented. Pups account for 46% of humeri at Gressbakken 5 and 45% of humeri at Bergeby 18 (Figure 6.7). Among the femora, 40% are pups at Gressbakken 5, and 53% are pups at Bergeby 18 (Figure 6.10).

The samples of measurable humeri and femora are fairly small in all cases (sample size ranges from 5 to 32). However, both the humerus and femur measurements show the same pattern at each house; either a predominance of adults or a more equal representation of pups and adults. This strengthens the case for two different patterns of harp seal hunting, one targeting adults and another taking roughly equal proportions of pups and adults.

6.5.5 Epiphysial fusion

Further evidence of the age breakdown of the hunted population is provided by the bone fusion data. The fusion sequence for harp seal was established by Storå (1994) and is presented in Table 6.4. The age at which fusion occurs varies between individuals, so that the skeletal development of an animal can provide only a rough approximation of its real age. The younger an individual, the more precisely its age can be estimated based on bone fusion, particularly if the early fusing bones, such as pelvis and scapula, are still unfused.

Because a bone's fusion state can usually provide only a rough maximum or minimum age[2], there is a considerable degree of uncertainty involved in trying to assess the age structure of a population based on epiphysial fusion. Nonetheless, in most cases however, the fusion data reinforce the trends illustrated by the humerus and femur shaft measurements. Unfused pelvis and scapula are the only elements which undeniably place

[2] Only if a bone is in the process of fusing can it provide a reasonable estimate of the age of an individual. Otherwise, an unfused epiphysis indicates that an animal must be under a certain age, a fused epiphysis that it must be over a certain age. In the case of a fused scapula, an individual could be anywhere from 2 to 30 years old; of an unfused distal tibia anywhere from newborn to 10 years old.

an individual in its first year, though the number of unfused stage 3 and 4 elements will also be suggestive. Any fused stage 3 bone indicates that an individual is over 2 years old and any fused stage 4 or 5 bone indicates a full-grown adult. The following discussion of bone fusion deals with all bones identified as either harp seal or large phocid. There is, as previously mentioned, a very strong probability that all "large phocid" bones are harp seal. The fusion tables do not include fibula, as tibia and fibula are joined proximally in phocids, and counting both tibia and fibula would greatly increase the likelihood of counting the same individual twice.

Table 6.4 Harp seal fusion sequence (after Storå 1994: 21)

Category	Approximate age	Epiphysial fusion	
Yearling	under 1 year	Stage 1	pelvis
		Stage 2	scapula
Juvenile	roughly 2-3 years sexually immature have not reached full size	Stage 3	proximal femur proximal radius distal humerus
Young Adult	sexually mature over 4-5 years up to ca. 10 years	Stage 4	distal femur proximal humerus proximal ulna proximal tibio-fibula
Adult	older adult roughly 10-30+ years	Stage 5	distal ulna distal radius distal tibio-fibula

The bone measurement data suggest that three houses, Gressbakken 3, Gressbakken 4, and Karlebotnbakken have much larger numbers of adult individuals than pups (Figures 6.6 and 6.9). At Gressbakken 3, the large numbers of fused relative to unfused pelvis bones would seem to suggest a paucity of very young individuals (Table 6.5a). However, as the pelvis generally fuses in the first two to three months (Storå 1994), it may have begun to fuse in some pups before they arrived in the Varangerfjord. Scapula may be a better indicator of the real proportions of pups and adults. The 37% pups and 63% adults indicated by the scapulae are consistent with the figures suggested by the shaft width measurements. The number of pups may be slightly higher than anticipated,

but the very low values of all unfused stage 3 and 4 bones (6-25%) indicate that young individuals were uncommon in this assemblage and that scapula fusion may over-emphasise their importance. The high levels of fusion for some stage 5 bones, 67% for distal tibia and 88% for distal ulna, indicate the presence of many old adults.

At Gressbakken 4 (Table 6.5b) there are very small numbers of both unfused pelves and unfused scapulae, 8% and 19% respectively, indicating very low percentages of pups. The percentage of unfused stage 3 and stage 4 bones are somewhat higher than at Gressbakken 3, ranging between 13% for proximal femur and 44% for proximal humerus. The larger numbers of unfused stage 3 bones at this house may indicate that there are more juveniles relative to mature adults in this assemblage than at Gressbakken 3.

At Karlebotnbakken there are likewise only small numbers of unfused scapulae (25%) and no unfused pelves (Table 6.5c). Here, the number of unfused stage 3 bones ranges from 0% for proximal radius to 40% for proximal femur. Unfused stage 4 bones range from 0% for proximal ulna to 32% for proximal humerus. All stage 5 elements show high fusion rates, 86% of distal tibiae are fused and 100% of distal radii and distal ulnae are fused, which indicates a considerable number of old adults in the assemblage.

Gressbakken 3 and Karlebotnbakken have higher overall rates of fusion than Gressbakken 4, suggesting that the harp seals hunted at the first two houses tended to be older and as a consequence larger on average than those at Gressbakken 4. This is borne out by the humerus and femur shaft measurements, which are larger on average at Gressbakken 3 and Karlebotnbakken than at Gressbakken 4 (Figures 6.6 and 6.9). The tooth sections also show larger numbers of older individuals at Gressbakken 3 than at Gressbakken 4 (Table 6.2), although it is difficult to know whether this is a product of the larger sample size at Gressbakken 3.

The humerus and femur shaft measurements indicate a more equal representation of pups and adults at Gressbakken 5 and Bergeby 18 (Figures 6.7 and 6.10) than at the other three houses, a trend which is supported by the bone fusion record. While only 8% of harp seal pelves at Gressbakken 5 are unfused, 40% of scapulae are unfused (Table 6.5d). As mentioned earlier, scapulae are a better indicator of the number of pups in an

assemblage, since the pelvis fuses so early. There is also a higher percentage of unfused bones overall at Gressbakken 5, where the average number of unfused bones at stages 3 and 4 is 47%, than at Gressbakken 3 (15%), Gressbakken 4 (30%) and Karlebotnbakken (20%).

At Bergeby 18, the fusion data is somewhat less clear, but nonetheless indicates a relatively high proportion of pups (Table 6.5e). There are an unusually large number of unfused pelvis bones at this house (9 out of 20, or 45%), indicating the presence of numerous very young individuals. In contrast, there is a complete lack of unfused scapulae, suggesting an absence of pups. The 100% fusion rate among this small sample of 15 scapulae is perhaps unrepresentative of the assemblage as a whole. Stage 3 elements, 45% of which are unfused, indicate that individuals under 2 years, many of them probably pups, are well represented. Older adults are numerous, as 66% of all stage 4 elements and 82% of all stage 5 elements are fused. Thus, the fusion data for pelvis and stage 3 elements suggest a considerable number of very young individuals in addition to the older adults indicated by the high degree of fusion among stage 4 and 5 elements.

The sites with very small samples of bones with recordable epiphysial fusion, Gressbakken 23 (Table 6.5f), Advik B (Table 6.5g), Høybukt 2 (Table 6.5h) and Høybukt 4 (Table 6.5i), all have a high degree of fusion in stages 1 to 3, suggesting that there are very few pups in these assemblages. At Advik B and Høybukt 4, there are also high levels of fusion among stage 4 and 5 elements, indicating the presence of very old adults. In contrast, at Høybukt 2 there are few fused stage 4 and 5 elements which might indicate that the adults being hunted were, on average, younger than those at Advik B and Høybukt 4. There was no available fusion data for stage 4 and 5 elements at Gressbakken 23. It would be presumptuous to draw any firm conclusions based on the fusion information from these four sites, since there are often just one or two specimens of each epiphysis.

The fusion data, then, indicate that Gressbakken 3, Gressbakken 4 and Karlebotnbakken have fewer pups relative to adults than Gressbakken 5 and Bergeby 18, a trend apparent in the humerus and femur shaft measurements. Bone fusion further suggests that the

Table 6.5 Harp seal bone fusion at late YSA houses in Varangerfjord

a) Gressbakken 3—Harp seal NISP=165; Large Phocid NISP=26

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	20	10	90	**1**
scapula	glenoid	41	37	63	**2**
femur	proximal	18	11	89	**3**
	distal	16	13	88	**4**
humerus	distal	21	10	90	**3**
	proximal	20	15	85	**4**
radius	proximal	20	25	75	**3**
	distal	8	88	12	**5**
ulna	proximal	16	6	94	**4**
	distal	17	12	88	**5**
tibia	proximal	18	22	78	**4**
	distal	24	33	67	**5**

b) Gressbakken 4—Harp seal NISP=147; Large Phocid NISP=31

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	38	8	92	**1**
scapula	glenoid	32	19	81	**2**
femur	proximal	23	13	87	**3**
	distal	23	26	74	**4**
humerus	distal	17	29	71	**3**
	proximal	18	44	56	**4**
radius	proximal	23	39	61	**3**
	distal	10	60	40	**5**
ulna	proximal	17	41	59	**4**
	distal	17	41	59	**5**
tibia	proximal	18	22	78	**4**
	distal	17	24	76	**5**

c) Karlebotnbakken—Harp seal NISP=69; Large Phocid NISP=12

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	4	0	100	**1**
scapula	glenoid	8	25	75	**2**
femur	proximal	10	40	60	**3**
	distal	10	30	70	**4**
humerus	distal	19	26	74	**3**
	proximal	19	32	68	**4**
radius	proximal	6	0	100	**3**
	distal	6	0	100	**5**
ulna	proximal	26	4	96	**4**
	distal	21	0	100	**5**
tibia	proximal	7	0	100	**4**
	distal	7	14	86	**5**

Table 6.5 continued

d) Gressbakken 5—Harp seal NISP=64; Large Phocid NISP=10

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	13	8	92	**1**
scapula	glenoid	5	40	60	**2**
femur	proximal	14	50	50	**3**
	distal	14	71	29	**4**
humerus	distal	12	42	58	**3**
	proximal	12	67	33	**4**
radius	proximal	8	25	75	**3**
	distal	9	33	67	**5**
ulna	proximal	9	11	89	**4**
	distal	11	36	64	**5**
tibia	proximal	6	33	67	**4**
	distal	7	43	57	**5**

e) Bergeby 18—Harp seal NISP=136; Large Phocid NISP=17

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	20	45	55	**1**
scapula	glenoid	15	0	100	**2**
femur	proximal	23	52	48	**3**
	distal	19	53	47	**4**
humerus	distal	24	54	46	**3**
	proximal	22	59	41	**4**
radius	proximal	28	32	68	**3**
	distal	27	41	59	**5**
ulna	proximal	21	10	90	**4**
	distal	23	4	96	**5**
tibia	proximal	14	7	93	**4**
	distal	22	5	95	**5**

f) Gressbakken 23—Harp seal NISP=5; Large Phocid NISP=2

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	5	0	100	**1**
femur	proximal	2	0	100	**3**
	distal	2	0	100	**4**

g) Advik B—Harp seal NISP=28; Large Phocid NISP=11

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	1	0	100	**1**
scapula	glenoid	9	22	78	**2**
femur	proximal	2	0	100	**3**
	distal	1	0	100	**4**
humerus	distal	6	0	100	**3**
	proximal	6	0	100	**4**
radius	proximal	5	20	60	**3**
	distal	5	20	60	**5**
ulna	proximal	6	33	67	**4**
	distal	3	0	100	**5**
tibia	proximal	5	0	100	**4**
	distal	4	0	100	**5**

Table 6.5 continued

h) Høybukt 2—Harp seal NISP=7; Large Phocid NISP=3

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	2	0	100	**1**
scapula	glenoid	2	0	100	**2**
femur	proximal	1	0	100	**3**
	distal	0	-	-	**4**
humerus	distal	2	0	100	**3**
	proximal	2	50	50	**4**
ulna	proximal	1	100	0	**4**
	distal	0	-	-	**5**
tibia	proximal	0	-	-	**4**
	distal	1	100	0	**5**

i) Høybukt 4—Harp seal NISP=7; Large Phocid NISP=1

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	1	0	100	**1**
scapula	glenoid	3	0	100	**2**
humerus	distal	1	100	0	**3**
	proximal	1	100	0	**4**
radius	proximal	0	-	-	**3**
	distal	1	100	0	**5**
ulna	proximal	1	0	100	**4**
	distal	0	0	-	**5**
tibia	proximal	1	0	100	**4**
	distal	1	0	100	**5**

Advik J—no *P. groenlandica* bones with fusion information

Kalkillebukta 17—3 *P. groenlandica* bones with fusion information
1 radius - proximal fused, distal unfused
1 ulna - proximal fused, distal unknown
1 tibia - proximal fused, distal unknown

adults at Gressbakken 4 were younger overall, and probably included more sexual immatures than either Gressbakken 3 or Karlebotnbakken.

6.6 Hunting ringed seal

Ringed seal was the second most numerous seal species in the Varanger assemblages, but its importance varied considerably between sites. Were there differences in the way that the ringed seal was hunted between sites? Was ringed seal hunted in much the same way and at the same time of year as the harp seal? The analytical techniques of long bone shaft measurements and bone fusion, which were used for harp seal, can also be applied to ringed seal in attempt to answer these questions.

Unfortunately, it was not possible to obtain the same high-quality sections from the ringed seal canines as from the harp seal ones. An attempt was made to section the ringed seal teeth using the method described for harp seal, but several of them shattered upon contact with the saw blades. Only four teeth sectioned using this method produced readable sections, all of them from Gressbakken 4. One of these individuals was only a few months old, the others were one, three and sixteen years old. None gave a clear indication of season of death. A sample of twenty-five ringed seal teeth were then sent to Bendik Nordanger in the histology section of Haukeland hospital, Bergen, where they were impregnated with glycerine, frozen, and thin-sectioned using a microtome. Canine sections were successfully produced in this manner, however, the internal structure of the teeth had deteriorated to such an extent that the sections were unreadable. Part of the difficulty in obtaining good sections from the ringed seal teeth may lie in the age of the individuals. Most of these teeth were from very young individuals where the canine was still only a thin shell around the pulp cavity, making the tooth more vulnerable to destructive processes.

6.6.1 Season

The same principles involved in using long bone shaft measurements to determine the season of the harp seal hunt can be applied to ringed seal, since they also give birth over a very short period of the year. Slightly more difficult, is establishing what time of year might be indicated by a seasonal gap in the measurements, should one appear. The author was unable to locate a reference collection of ringed seal from a seasonal kill, or

even a large collection of ringed seal of known season of death, making it impossible to create a comparative data set for ringed seal comparable to the one Jan Storå (1994) gathered using the NRM collection of harp seals[3]. However, since ringed seals are rarely found in completely ice-free areas (McLaren 1962) and today withdraw from Varangerfjord as the ice retreats in the spring (Bjørn Bergflødt, pers. comm.), it seems reasonable to expect that there will be a seasonal gap in the measurements, and that this gap will indicate the summer absence of these animals.

The ringed seal measurements discussed below include several humeri and femora that were only identified as "small phocid" There is therefore a small chance that some harbour seal bones have been included in the samples. However, this is unlikely given the very small numbers of positively identified harbour seal bones in the assemblages, and it does not appear to have influenced the results (except perhaps in a single case which will be discussed below).

There is, as predicted, a marked gap in the measurement distributions of ringed seal humerus and femur shaft width at all of the Varanger sites. The humerus measurement distributions at Gressbakken 3, 4, and 5 all break at a width of roughly 1.8 cm and a breadth of roughly 1.3 cm (Figure 6.12)[4]. The remaining houses, none of which have large numbers of measurable humeri, are presented together (Figure 6.13). This conglomerate distribution shows a gap at the same point as that for the Gressbakken Nedre Vest houses.

The femur shaft measurements from all of the Gressbakken Nedre Vest houses also have a break in their distribution around a width of 1.85 cm and a breadth of 0.85 cm (Figure 6.14). The clarity of this gap is somewhat blurred at Gressbakken 5, where the first femur above the gap falls almost within the size range of a summer pup. This may well represent an inexperienced pup which spent its first summer in Varangerfjord. Alternatively, it may be harbour seal bone. It was identified only as "small phocid" and it

[3] The establishment of such a reference collection of ringed seals would prove invaluable to zooarchaeologists working in northern coastal areas where ringed seals make up a significant part of the faunal assemblage. Unfortunately, large numbers of dead animals are difficult to come by within a short period of time and it would be hard to justify killing them merely to establish a reference collection of skeletons (not to mention very expensive and time consuming).

[4] The distribution from Gressbakken 5 does not technically "break" because it has no measurements above the gap. There are, however, no measurements from this house in the gap either.

may have been a mistake to include it with the ringed seal measurements. However, without a modern data set for comparison, there is no way of knowing what size of gap to expect in the measurements from a seasonal kill, and the measurement in question may fall within the expected size range for juveniles, requiring no further explanation. At the lower end of this distribution is a single very small femur from House 4. The size, shape and texture of this bone all indicate that it is foetal.

When the ringed seal femur measurements from all the remaining houses are plotted together, there is a large gap in their distribution, which again centres around a width of 1.75 cm and a breadth of 0.85 cm (Figure 6.15). This is, admittedly, a very small sample and the data from several houses have been combined. However, when it is viewed alongside the humerus data from the same houses and all of the measurements from Gressbakken Nedre Vest, a seasonally restricted kill is strongly indicated.

6.6.2 Age distribution

Even more striking, and more unexpected, is the degree to which ringed seal pups outnumber adults. In the case of harp seal, the seasonal gap in the measurement distributions divides pups born that year from juveniles twelve months their senior. Without comparative data, it cannot be demonstrated conclusively that the same holds true for ringed seal, but it seems by far the most likely explanation. Assuming that the gap separates pups from juveniles, pups vastly outnumber juveniles and adults in every case. At Gressbakken 3, pups account for 93% of humeri and 94% of femora, at Gressbakken 4 they make up 95% of humeri and 75% of femora, and at Gressbakken 5 they account for 100% of humeri and 64% of femora[5] (Figures 6.12 and 6.14). Advik J, Bergeby 18, Høybukt 2, Kalkillebukta 17, Karlebotnbakken and Gressbakken 23 all have between zero and two measurable humeri, and zero and three measurable femora (Figures 6.13 and 6.15). All of these are pups except for a single humerus and a single femur from Kalkillebukta 17.

At all sites, the overall size difference between pups and mature adults is not large (Figures 6.12 to 6.15). This suggests that the adults in the sample are small, and may indicate a lack of sexually mature full-grown adults. Today, preferred ringed seal

[5] The percentage of pups indicated by femora at Gressbakken 5 would increase to 70% if the bone discussed in the penultimate paragraph of section 6.6.1 is, in fact, a harbour seal.

habitats with large amounts of thick landfast ice are occupied by mature adults, while less attractive areas with thinner, more sporadic ice cover, such as Varangerfjord, are generally occupied by juveniles (McLaren 1962). The same was probably true 4000 years ago. However, the age structure of the population could be as much a factor of human hunting patterns as past availability, and the claim that large adult ringed seals are rare in the Varanger material is speculative, given the absence of modern comparative specimens.

The ringed seal fusion data reinforce the dominance of pups in the assemblage, and also indicate the presence of juveniles and small numbers of sexually mature adults in the assemblages. "Small phocid" bones are again included with positively identified ringed seal bones in this analysis. Jan Storå (pers. comm.) has determined that the fusion sequence for ringed seal is the same as that for harbour seal. The ages given for each stage of fusion in harp seals probably apply to ringed seal also, though it should be stressed again that these are very rough approximations (Table 6.4).

At Gressbakken 3, 4 and 5, there are large percentages of unfused pelvis bones (60%, 41% and 42% respectively—Table 6.6a-c), when compared to the figures observed for harp seal. These values are particularly high considering the very early age at which the pelvis fuses. The large percentages of unfused scapulae in these assemblages further indicate large numbers of pups, 89% at Gressbakken 3, 63% at Gressbakken 4, and 68% at Gressbakken 5. In addition, the high numbers of unfused stage 3 and 4 elements, 80-100% at Gressbakken 3, 60-94% at Gressbakken 4 and 57-90% at Gressbakken 5, reflect considerable numbers of juveniles, pups and perhaps also young adults. Proximal tibia, which fuses at stage 4, is an exception, since it is fused in 100% of cases at Gressbakken Nedre Vest. This high fusion rate could be related to preservation, as proximal tibia is found infrequently relative to other elements, and unfused bones would be more vulnerable to destruction than fused ones. There are small numbers of fused stage 4 and 5 bones at all three Gressbakken Nedre Vest houses, indicating the presence of at least a few older adults.

The other houses; Gressbakken 23, Bergeby 18, Karlebotnbakken, Advik B, Advik J, Høybukt 2 and Høybukt 4, have much smaller samples (the number of epiphyses with fusion information ranges from 5-26, as opposed to 122-151 at Gressbakken Nedre

Table 6.6 Ringed seal bone fusion in the Varanger assemblages

a) Gressbakken 3—Ringed seal NISP=29; Small Phocid NISP=33

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	5	60	40	**1**
scapula	glenoid	19	89	11	**2**
femur	proximal	8	88	13	**3**
	distal	5	80	20	**4**
humerus	distal	10	80	20	**3**
	proximal	7	100	0	**4**
radius	proximal	8	100	0	**3**
	distal	5	100	0	**5**
ulna	proximal	4	100	0	**4**
	distal	4	75	25	**5**
tibia	proximal	2	0	100	**4**
	distal	3	0	100	**5**

b) Gressbakken 4—Ringed seal NISP=31; Small Phocid NISP=69

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	17	41	59	**1**
scapula	glenoid	8	63	38	**2**
femur	proximal	10	60	40	**3**
	distal	11	73	27	**4**
humerus	distal	34	94	6	**3**
	proximal	24	96	4	**4**
radius	proximal	6	83	17	**3**
	distal	5	80	20	**5**
ulna	proximal	18	94	6	**4**
	distal	11	91	9	**5**
tibia	proximal	1	0	100	**4**
	distal	2	50	50	**5**

c) Gressbakken 5—Ringed seal NISP=35; Small Phocid NISP=50

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	12	42	58	**1**
scapula	glenoid	22	68	32	**2**
femur	proximal	10	70	40	**3**
	distal	7	57	43	**4**
humerus	distal	14	86	14	**3**
	proximal	9	89	11	**4**
radius	proximal	10	90	10	**3**
	distal	5	80	20	**5**
ulna	proximal	11	73	27	**4**
	distal	14	71	29	**5**
tibia	proximal	4	0	100	**4**
	distal	4	50	50	**5**

d) Gressbakken 23—Ringed seal NISP=5; Small Phocid NISP=10

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	3	67	33	**1**
scapula	glenoid	1	100	0	**2**
femur	proximal	2	50	50	**3**
	distal	1	0	100	**4**
humerus	distal	4	100	0	**3**
	proximal	3	100	0	**4**
radius	proximal	1	100	0	**3**
	distal	1	100	0	**5**
ulna	proximal	4	100	0	**4**
	distal	2	100	0	**5**
tibia	proximal	1	0	100	**4**
	distal	1	0	100	**5**

Table 6.6 continued

e) Bergeby 18—Ringed seal (NISP=10) and Small Phocid (NISP=5)

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	1	100	0	**1**
scapula	glenoid	2	0	100	**2**
femur	proximal	3	100	0	**3**
	distal	3	100	0	**4**
humerus	distal	1	100	0	**3**
	proximal	1	100	0	**4**
radius	proximal	3	67	33	**3**
	distal	3	100	0	**5**
ulna	proximal	4	100	0	**4**
	distal	3	100	0	**5**
tibia	proximal	1	100	0	**4**
	distal	1	100	0	**5**

f) Karlebotnbakken—Ringed seal NISP=3; Small Phocid NISP=4

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	1	100	0	**1**
femur	proximal	1	100	0	**3**
	distal	0	-	-	**4**
humerus	distal	1	100	0	**3**
	proximal	1	100	0	**4**
radius	proximal	3	67	33	**3**
	distal	2	50	50	**5**
ulna	proximal	1	100	0	**4**
	distal	0	-	-	**5**

g) Advik B—Ringed seal NISP=4; Small Phocid NISP=3

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
pelvis	acetabulum	1	0	100	**1**
humerus	distal	1	100	0	**3**
	proximal	0	-	-	**4**
radius	proximal	0	100	0	**3**
	distal	0	-	-	**5**
ulna	proximal	3	33	67	**4**
	distal	3	33	67	**5**
tibia	proximal	1	0	100	**4**
	distal	1	0	100	**5**

h) Advik J—Ringed seal NISP=4; Small Phocid NISP=1

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
scapula	glenoid	1	100	0	**2**
humerus	distal	1	100	0	**3**
	proximal	1	100	0	**4**
radius	proximal	1	100	0	**3**
	distal	2	50	50	**5**
tibia	proximal	1	100	0	**4**
	distal	1	100	0	**5**

Table 6.6 continued

i) Høybukt 2—Ringed seal NISP=3; Small Phocid NISP=1

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
scapula	glenoid	1	100	0	**2**
humerus	distal	1	100	0	**3**
	proximal	0	-	-	**4**
ulna	proximal	2	100	0	**4**
	distal	1	100	0	**5**

j) Høybukt 4—Small Phocid NISP=6

Element	Epiphysis	Number	% unfused	% fused or fusing	fuses at stage
femur	proximal	1	100	0	**3**
	distal	1	0	100	**4**
humerus	distal	1	100	0	**3**
	proximal	2	100	0	**4**
radius	proximal	1	100	0	**3**
	distal	0	-	-	**5**
ulna	proximal	1	100	0	**4**
	distal	1	100	0	**5**

Kalkillebukta 17—3 *P. hispida* bones with fusion information

1 scapula - fused

1 humerus - proximal fused, distal fused

1 femur - proximal fused, distal unknown

Vest), but show the same general trends. All have predominantly unfused epiphyses, almost to the exclusion of fused elements (Table 6.6.d-j). Again, the very young age of the hunted ringed seal population is emphasised.

6.7 Conclusion: Seal hunting techniques and prey selection

Several different seal hunting techniques have been documented ethnographically among the Saami of North Norway and other northern groups. Netting was a widely used technique in Finnmark, with nets placed at favourite hauling out places or in the shallow waters of feeding areas or narrow straits (Broadbent 1979; Helland 1905: 703; Lloyd 1867). There are several accounts of harbour seals being taken in salmon nets in the Tana river in the early nineteenth century (Collett 1912: 379; Helland 1905: 704). Nets were also traditionally used to catch ringed seals at their breathing holes in the ice during the winter months (Broadbent 1979; Lloyd 1867).

Two other methods of ringed seal hunting observed among the Inuit of Arctic North America may also have been practised in northern Norway. Groups of Inuit men would hunt ringed seal at their breathing holes using harpoons. They used dogs to locate a series of breathing holes belonging to a ringed seal. Each hunter would then partially expose one of the holes and fix a piece of down above it. When the seal came up to breathe, the down would move and the hunter, who had been waiting patiently, would strike (Balikci 1970: 67-77). Individual hunters would also steal up on seals as they basked on the ice during the spring, dispatching them with a harpoon or club (Nelson 1966: 46).

None of these methods are suited to hunting harp seals, which are generally found in open water in Varangerfjord (Renouf 1989: 24-25). Harp seals were probably "taken from a boat with the use of a harpoon or some similar throwing or thrusting implement" (Renouf 1989: 25).

The majority of seal hunting in Varangerfjord appears to have taken place in the spring, shortly before and after the annual break up of the ice. Harp seals migrated into the area in late March and April, and the new-born ringed seal pups could be found basking on the ice at this time. There was a marked difference in the hunting patterns of harp seal

and ringed seal at all of the excavated Gressbakken-type houses in Varanger. Young pups were the focus of the ringed seal hunt. These pups are born with a white coat and rely heavily on camouflage to protect them from predators on the ice, making them easy prey. They were probably hunted by individual hunters on foot using clubs and harpoons. The adult ringed seals in the assemblages may have been hunted opportunistically during the quest for ringed seal pups or harp seals, or they may have been taken more deliberately using nets or harpoons at their breathing holes.

Adult harp seals are much better represented than adult ringed seals and accounted for at least half of the harp seal hunt at each house. Harp seals do not pull out on land and rarely haul out on ice except in the moulting and breeding areas in the White Sea. This makes them considerably more difficult to catch than ringed seal pups. Given their tendency to remain in open water in Varangerfjord, harp seals might have been taken by groups of hunters in boats. Boating technology was almost certainly known during the north Norwegian Younger Stone Age, as suggested by depictions of large boats among the rock art at Alta, Finnmark (Figure 6.16), the earliest of which have been dated between 4200 and 3600 BC (K. Helskog 1988). Simonsen also recovered several bone and antler artefacts at Gressbakken which he identified as skin boat components (Simonsen 1961: 299)

Hunting from boats would have involved a considerable input of time and energy, and would probably have been a co-operative venture, given the resources required to build and maintain a boat. This might help to explain the large numbers of adult harp seals, since they represent the biggest return on this investment. Naturally, young harp seals were also taken because they are less experienced and therefore less wary than the older adults, but adults would have been preferred because they provided the largest amounts of meat, blubber, and skin.

However, seal hunting was not a standardised activity across all of the Varanger sites, and there are variations which must be explained. A seasonal difference in seal hunting activity does not account for the higher numbers of ringed seal at Gressbakken Nedre Vest than at Karlebotnbakken and Bergeby 18, since the majority of ringed seals at all of these sites are young pups which must have been killed in the spring. Perhaps ringed seal were more common near Gressbakken due to more favourable ice conditions created by

the convoluted coastline. If this was, indeed, the reason for the difference, then ringed seal hunting occurred close to home.

Another difference occurs in the age breakdown of the hunted harp seal population. There are more adults relative to pups at Gressbakken 3, Gressbakken 4 and Karlebotnbakken than at Gressbakken 5 and Bergeby 18. If the houses were all occupied at different times, this could relate to fluctuations in the age structure of the harp seal population. The harp seal migration into Varangerfjord might have included fewer adults on average at the time when Gressbakken 5 and Bergeby 18 were occupied. Unfortunately, there are few radiocarbon dates from each house and they are not precise enough to determine whether or not the houses are contemporaneous.

Whether or not the houses were occupied simultaneously, the differences could also have been caused by variations in either hunting ability or access to hunting grounds and boats at each house. In such a case, higher levels of hunting skill and/or access to better hunting territory and technology are suggested for Gressbakken 3, Gressbakken 4 and Karlebotnbakken than for Gressbakken 5 and Bergeby 18. The first three houses have more adult harp seals relative to pups, and represent a better caloric return on the energy expended during hunting. The higher proportions of pups at Gressbakken 5 and Bergeby 18 suggest that the occupants of these houses may not have had the same level of access to highly prized adult harp seals. The reasons for these inter-assemblage differences and their implications with regard to late Younger Stone Age social organisation will be considered more fully in Chapter 8.

Spring was doubtless a busy time in Varangerfjord during the Gressbakken phase, particularly at the inner-fjord sites where cod was the most heavily exploited fish species. A number of important migratory marine species converged in the area at this time of year; spring cod, young ringed seal pups and harp seals of all ages. The faunal remains in the middens attest that all were heavily exploited by the human occupants of the fjord. This must have been a welcome change after the relative scarcity of available food during the winter.

CHAPTER 7

SEA AND LAND: SEAL AND REINDEER EXPLOITATION

7.1 Introduction

The title for this chapter is borrowed from Håkon Olsen's unpublished manuscript *Sjø og Land* (n.d.), which documented the mammalian species from Simonsen's (1961, 1963) excavations in Varanger, and was intended as the final volume of the *Varangerfunnene* series. H. Olsen dealt at length with the biases inherent in any collection of bone from an archaeological context, and attempted to "calculate away" the problems of comparing fragment counts of fish, bird, seal, whale, reindeer and other terrestrial mammals. For reasons outlined in Chapter 5, no attempt will be made here to compare the use of taxa with such a wide range of body-sizes. A large part of Olsen's investigation also aimed to determine whether the harp seals present in Varangerfjord 4000 years ago were part of the same population as those which inhabited the Littorina Sea much farther south. He conducted an extensive metrical analysis in an attempt to establish the average body length of each age class within the harp seal population, comparing them to both modern skeletons and archaeological collections of bone from the Baltic region.

The analysis presented here deals little with the composition of past animal populations for their own sake, and focuses more on what the faunal material reveals about human activity. As was demonstrated in Chapter 4, the species lists from the terminal YSA sites around Varangerfjord clearly indicate the dominance of marine species. Large numbers of fish, sea birds, and seals show that most hunting activity was directed seaward. Terrestrial species comprise a very small percentage of the bone count, and probably made only a minor contribution to the diet. Nonetheless, there are indications that reindeer played a far more important role in the prehistoric economy and society of Varangerfjord than is suggested by looking at the species lists alone.

The discussion which follows examines the patterns of body part representation for the most important marine taxon, seal, and the most important terrestrial mammal, reindeer, at the YSA sites around Varangerfjord. It explores the potential of this method to illustrate and explain differences in the exploitation of these animals both within and

between sites, and goes on to discuss fundamental differences in the use of these two resources.

7.2 Seal Body Part Representation

The patterns of seal exploitation discussed in Chapter 6 relate to the selection of different seal species and different age classes within each species by human hunters. Amongst ethnographically documented hunter-gatherers, there is generally a division of labour between men and women (Kelly 1995: 262). Men tend to hunt large game, while women gather plant foods and participate in small game hunting. However, only rarely are these activities performed exclusively by either men or women. In cold high latitude environments, where a large part of the diet is meat, men tend to procure the majority of food, while the dietary contributions of men and women are more matched in warmer regions (ibid). Varanger may deviate somewhat from this trend, since fish were a major source of food in the region and women may have played an important role in fish procurement. Nonetheless, seals, as large mammals, were probably hunted primarily by men. Prey selection, as outlined in Chapter 6, was determined by a small segment of the community; men, and perhaps some women, of hunting age. In this chapter, seal skeletal element representation reflects decisions made by these hunters at the kill site about what carcass parts to return to the base camp. It is also a product of decisions made at the base camp about further butchery, distribution and disposal of the hunted seals. These three choices could have been made by a much wider range of community members.

7.2.1 Identifiability

The problems involved in identifying different elements of the phocid skeleton to species make it impossible to discuss the representation of these elements at the species level. To do so would be more a measure of the identifiability of certain bones than of their true representation within the assemblage. There is a relatively wide degree of intra-species variation in skeletal morphology among phocid seals, coupled with strong similarities between species (see Appendix B). Certain elements are more easy to identify to the species level than others. As a result, some fragments in this analysis were identified only as large or small phocid, others were narrowed down to two or three species (e.g. ringed seal / harbour seal), and still others were attributed to a particular species.

Cranial fragments, especially the auditory bulla, are easiest to identify and would be greatly over-represented in any group of bones identified to species. Also easy to identify are mandible, scapula, humerus (though it can be difficult to differentiate between harp seal and grey seal and between ringed seal and harbour seal), ulna (though it can be difficult to distinguish ringed seal from harbour seal), femur and pelvis (though here again, it can be difficult to distinguish ringed seal from harbour seal). Radius and tibio-fibula are more difficult to identify and their species can only be determined in a small number of cases. Vertebrae, ribs, costal cartilage, metapodi and phalanges are almost impossible to identify to the species level. Bearded seal metapodi and phalanges are an exception, as they are very characteristic and noticeably larger than those of any other species in question.

To illustrate the problem of differential identifiability between species, Figure 7.1 shows the representation of skeletal elements for all positively identified ringed seal and harp seal elements at Gressbakken Nedre Vest. Both show a predominance of cranium and mandible fragments, which doubtless reflects the reliability of these bones as species indicators. Scapula, the most reliable species indicator of the post-cranial skeleton, is also well represented for both species. There are several points of difference between the two species, which relate to their morphological particularities. Harp seal scapula, humerus and pelvis are better represented than those of ringed seal, while proximal radius and proximal ulna are more common relative to other elements among ringed seal than harp seal.

Although ringed seal bones tend to be somewhat smaller, more slender and sharper-edged than harbour seal bones, there is considerable overlap in terms of both size and morphology for these species, making only the outer ends of the spectrum of variation identifiable to species. While there is some overlap between harp seal and grey seal, it is less pronounced than that between ringed seal and harbour seal. This makes post-cranial elements of the harp seal skeleton easier to identify to the species level than those of ringed seal. The two elements which are better represented among ringed seal than harp seal, distal radius and proximal ulna, are very characteristic for ringed seal, and can be more reliably distinguished from harbour seal than any of the other elements.

Because of these differences in the identifiability of skeletal elements between seal species, the following analysis will combine all of the phocid material from each context. This will obviously make it impossible to detect any inter-species differences in terms of carcass transport. While the picture presented will be a composite of all the seal species in the middens, it should provide a reasonably accurate representation of the distribution of harp seal elements, since this species dominates most of the phocid assemblages. Ringed seal is unlikely to interfere in the overall pattern because, as was demonstrated in Chapter 6, the majority of ringed seals hunted at the Varanger sites were juveniles, small individuals which were probably returned to the site whole.

7.2.2 Spearman's rho: Testing trends statistically

Spearman's rank order correlation coefficient (r_s or rho) was selected to test the significance of the relationship between the element representations at each of the houses. Rho evaluates the probability that the differences in rank order between two samples could be due to chance variation (Thomas 1986). It applies to ordinal scale variables, and is therefore appropriate in dealing with zooarchaeological measures of abundance which are widely accepted as ordinal scale rather than interval scale (see discussion in section 5.5). Rho is a highly robust statistical test, since it does not assume normal distributions or depend on means, standard deviations or scatter plots (Drennan 1996: 233). Lyman *et al.* (1992) use it when comparing their seal meat utility index to seal bone assemblages from archaeological sites in Oregon and the arctic, as does Diab (1998) when discussing the relationship of ringed seal MAUs at archaeological sites to his ringed seal meat utility index and phocid seal bone mineral density.

Values of r_s can range between -1.0 and +1.0, with the sign indicating the direction of the correlation, and the number its strength. The closer the number to one, the stronger the correlation. The level of significance (P) associated with the test indicates the likelihood that a "sample of this size with a correlation this strong could be selected from a population where there is no correlation" (Drennan 1996: 231). A P value of 0.05 or lower is generally considered significant in the social sciences (Thomas 1986: 216), and will be adopted here. However, the question of setting a critical level of significance is somewhat irrelevant in this case, as all of the P values associated with strong (i.e. greater than 0.60) r_s values for seal element distribution are below 0.005.

Because r_s applies to ordinal scale measurements, each skeletal element must be assigned a ranking relative to the other elements at each of the houses. An example of converting %MAU values to rank order values is presented in Table 7.1. In the case of a tie, standard practice is to split the ranking between the tied elements. These rankings can then be compared to those from another house or to ranked values of bone density or meat utility using r_s. All r_s values presented in this thesis are for two-tailed tests.

Table 7.1 Derivation of seal skeletal element rankings from %MAU (for Gressbakken 3 and Gressbakken 5: r_s=0.72, P<0.001)

	Gressbakken House 3		Gressbakken House 5	
Element	% MAU	Rank	% MAU	Rank
cranium	100.0	1	100	1
mandible	79.7	2	63.3	2
atlas	79.1	3	42.9	3
scapula	36.8	4	33.7	4
prox. radius	33.0	5	29.6	7
dist. femur	26.9	6	27.6	8
cervical	26.4	7.5	5.3	19
dist. humerus	26.4	7.5	24.5	9
prox. ulna	25.8	9	31.6	5
lumbar	24.2	10	22.9	11
prox. tibia	24.1	11	13.3	17
thoracic	23.1	12.5	4.7	20
pelvis	23.1	12.5	30.6	6
prox. femur	22.0	14	23.5	10
metatarsal	21.6	15	16.7	14
prox. humerus	19.2	16	17.3	13
dist. ulna	15.4	17	14.3	16
dist. radius	13.7	18.5	16.3	15
dist. tibia	13.7	18.5	21.4	12
axis	9.9	20	8.2	18
metacarpal	9.7	21	4.3	21

7.2.3 Comparison of seal body part representation at each house

Only houses with a total seal MAU of fifty or greater will be included in the discussion of seal body part representation. The representation of twenty-one elements and parts of elements are considered, and a total MAU of less than fifty means that MAU for each element is very small. Element distributions in these small samples are more subject to random variation than those of larger samples. The seal samples from Advik J and Kalkillebukta 17 are therefore excluded due to their small size.

There is a good correlation between the body part distributions at all three houses at Gressbakken Nedre Vest (see Table 7.2), particularly between House 4 and House 5 (r_s=0.84, P<0.001). The three distributions show remarkably similar trends and are heavily dominated by crania and mandibles (Figure 7.2). Vertebrae are scarce, though atlas is considerably better represented than any other vertebra, and there are few metacarpi. All other elements are relatively evenly distributed, ranging from 15-40 %MAU. House 4 deviates slightly from this pattern, in that certain important meat-bearing elements, namely humerus, pelvis and femur are more numerous than at the other two houses.

Table 7.2 Spearman's rho (r_s) values for the correlation between seal element distributions from the YSA houses around Varangerfjord

Gressbakke n 4	**r_s=0.72* P<0.001**						
Gressbakke n 5	**r_s=0.72* P<0.001**	**r_s=0.84* P<0.001**					
Gressbakke n 23	r_s=0.21 P=0.36	r_s=0.57 P=0.01	r_s=0.38 P=0.09				
Advik B	r_s=0.44 P=0.05	r_s=0.57 P=0.01	r_s=0.47 P=0.03	r_s=0.23 P=0.32			
Bergeby 18	r_s=0.55 P=0.02	**r_s=0.68* P=0.002**	**r_s=0.71* P=0.001**	r_s=0.11 P=0.65	r_s=0.45 P=0.06		
Høybukt 2	r_s=0.19 P=0.40	r_s=0.48 P=0.03	r_s=0.49 P=0.02	r_s=0.32 P=0.16	r_s=0.03 P=0.90	r_s=0.30 P=0.22	
Høybukt 4	r_s=0.53 P=0.01	**r_s=0.64* P=0.002**	**r_s=0.61* P=0.003**	r_s=0.42 P=0.06	r_s=0.25 P=0.27	r_s=0.51 P=0.03	r_s=0.53 P=0.01
Karlebotn 1	r_s=-0.02 P=0.95	r_s=0.35 P=0.16	r_s=0.26 P=0.30	r_s=0.16 P=0.54	r_s=0.29 P=0.24	r_s=0.50 P=0.03	r_s=0.08 P=0.76	r_s=0.53 P=0.02
	Gress-bakken 3	Gress-bakken 4	Gress-bakken 5	Gress-bakken 23	Advik B	Bergeby 18	Høybukt 2	Høybukt 4

*indicates particularly strong (greater than 0.60) statistically significant r_s values

Another strong correlation exists between the seal element distributions at Bergeby 18 and both Gressbakken 4 (r_s=0.68, P=0.002) and Gressbakken 5 (r_s=0.71, P=0.001). Here, as at Gressbakken, there is a preponderance of crania. However, in this case, crania do not outnumber post-cranial elements to the same extent. There are large proportions of certain post-cranial elements at Bergeby 18, notably scapula, proximal and distal femur and proximal radius (Figure 7.3). The similarity in the overall trends of seal element representation at Gressbakken Nedre Vest and Bergeby 18 suggest that similar patterns of carcass disposal occurred on both sites. None of the other houses correlate significantly with either this group or with each other (Table 7.2). Høybukt 4 is

a possible exception. Its element distribution bears some similarity to the Gressbakken Nedre Vest houses and Bergeby 18, correlating most strongly with the distributions from Gressbakken 4 (r_s=0.64, P=0.002) and Gressbakken 5 (r_s=0.61, P=0.003). At Høybukt 4, atlas is far better represented than any other skeletal element, all of which range from 0-28 %MAU (Figure 7.3). Though the small numbers of crania and mandibles make the distribution of head elements very different from those at Gressbakken Nedre Vest, the curves for post-cranial elements are very similar. Seal data from Høybukt 4 must be viewed with some caution, however, since this is the smallest sample under discussion (total MAU=64).

At Høybukt 2, though it does not have a strong correlation with the Gressbakken Nedre Vest houses, there is again a predominance of crania (Figure 7.4). As at Gressbakken Nedre Vest, post-cranial elements are strongly outnumbered by cranial elements, though in this case very few mandibles and atlas vertebrae are present. At Karlebotnbakken, conversely, there are fewer crania, large numbers of mandibles and appendicular elements are well represented (Figure 7.4). Neither Gressbakken 23 nor Advik B correlate strongly with any of the other houses. Both have low numbers of crania (30% MAU), and there are large numbers of certain appendicular elements (Figure 7.5).

7.2.4 Skeletal element representation, bone mineral density and meat utility indices

Are the similarities observed between Gressbakken 3, 4 and 5 and Bergeby 18 due to some natural taphonomic process or to deliberate human behaviour? This question can also be asked of the distributions at the other houses. If non-human factors such as canid activity or natural post-depositional destructive processes were primarily responsible, one might expect a correlation between the representation of elements and bone mineral density. Diab (1998) found a strong positive correlation between ringed seal MAU and bone mineral density at Thule period and historic Inuit sites in the eastern Canadian arctic and Greenland (r_s ranged between 0.70 and 0.92, with P values of 0.04 or less). Given this, and the lack of any significant correlation between ringed seal MAU and the meat utility index[1], he concluded that bone destruction had taken place: "certain skeletal elements are absent due to cultural activities which took place around the settlement,

[1] Spearman's rho correlation coefficients between ringed seal MAU and %MUI ranged between -0.13 and 0.23, with P values of 0.40 to 0.96 (Diab 1998: 14-15).

such as dog-related destruction, and not differential transport from kill sites" (Diab 1998: 17).

At the Varanger sites there is generally only a weak positive correlation between seal MAU and bone mineral density (Table 7.3). Figures 7.6 to 7.11 are scatter plots showing the relationship between bone mineral density and MAU for houses where the total MAU is greater than 100. Bone mineral density values are available for a number of different scan sites on each element of the seal skeleton (Chambers 1992, published in Lyman 1994: 244-248). The values used in this analysis are for the scan site which most closely corresponds to the zone of each element upon which MNE and MAU are based.

Table 7.3 Spearman's rho values for the correlation of seal element representation at each house with bone mineral density, meat utility (%MUI) and modified meat utility (%MMUI)

	Bone Mineral Density (from Chambers 1992 in Lyman 1994:248)	**% MUI** (from Lyman *et al.*. 1992:537)	**% MMUI** (from Lyman *et al.*. 1992:540)
Gressbakken 3	r_s=0.22 *P*=0.20	r_s=0.38 *P*=0.05	r_s=0.36 *P*=0.05
Gressbakken 4	r_s=0.41 *P*=0.50	r_s=0.25 *P*=0.14	r_s=0.23 *P*=0.26
Gressbakken 5	**r_s=0.64*** ***P*=0.003**	r_s=0.20 *P*=0.21	r_s=0.26 *P*=0.13
Gressbakken 23	r_s=0.35 *P*=0.09	r_s=0.16 *P*=0.25	r_s=0.11 *P*=0.31
Advik B	r_s=0.29 *P*=0.13	r_s=0.13 *P*=0.30	r_s=-0.10 *P*=0.33
Bergeby 18	r_s=0.52 *P*=0.02	r_s=-0.36 *P*=0.07	r_s=-0.17 *P*=0.26
Høybukt 2	r_s=0.07 *P*=0.39	r_s=0.17 *P*=0.24	r_s=0.31 *P*=0.08
Høybukt 4	r_s=0.37 *P*=0.07	r_s=-0.08 *P*=0.38	r_s=0.05 *P*=0.42
Karlebotn	**r_s=0.65*** ***P*=0.004**	**r_s=-0.63*** ***P*=0.003**	**r_s=-0.60*** ***P*=0.004**

* indicates particularly strong (i.e. greater than 0.60) statistically significant r_s values

Only two houses, Gressbakken 5 and Karlebotn 1, have rho values of greater than 0.60 for the correlation between element MAU and bone mineral density. This suggests that the similarities observed at Gressbakken Nedre Vest, and Bergeby 18 cannot be attributed purely to density mediated destruction. Nor can the patterns of element distribution observed at any of the other houses, with the possible exception of Karlebotnbakken, be explained by the activity of dogs or natural post-depositional

destruction. The weak correlation between MAU and bone mineral density at the Varanger house depressions is not surprising given that very few of the seal bones from these sites show evidence of carnivore gnawing. There is also no evidence that humans broke seal bones to extract the marrow, though they did break reindeer long bones for this purpose (see section 5.2.2).

Another possible explanation for the patterns observed is a human tendency to select certain parts of the carcass over others for return to the base camp. Meat utility indices, first developed by Binford (1978) for sheep and caribou, are designed to test for exactly this kind of behaviour (see section 7.3.2 for a more detailed discussion of the caribou indices derived by Binford and others). Two meat utility indices have been developed for phocid seals, the first (Lyman *et al.* 1992) was derived using three harp seal carcasses and a hooded seal, the second (Diab 1998) using three ringed seals. In both cases, the meat associated with each element (or group of elements, such as ribs) was removed from the skeleton and weighed. These weights were then averaged for all of the butchered carcasses to produce MUI values. The average weights were converted to %MUI by dividing the meat weight for each element by the heaviest meat weight and multiplying by 100. The element with the highest meat weight therefore has a %MUI values of 100. There is a strong correlation between the Lyman %MUI values for harp seals and Diab's %MUI for ringed seals (r_s=0.97, P<0.001), indicating that similar results will be obtained when applying the two indices to the same sample. Lyman's meat utility index (Table 7.4) has been selected for comparison in this case as harp seals tend to be far more common in the Varanger assemblages than ringed seals, and it should still be applicable at sites where ringed seal outnumber harp seal[2].

In the case of the Varanger house depressions, the nature of the sites suggests well-established base camps. If only partial carcasses were being returned from the kill sites, selection for elements with higher meat utility would be expected. However, this is not the case. Table 7.3 illustrates that there is no strong positive correlation between MAU and either MUI or MMUI at any of the houses. The only significant correlation is a negative one at Karlebotnbakken. This negative correlation indicates that high MAU

[2] The modified meat utility index (MMUI) is an adjusted version of the MUI which takes into account the fact that some bones with little meat articulate with important meat-bearing bones and are often transported along with them. The MMUI can be normed to produce %MMUI by dividing the MMUI value for each element by the largest MMUI value and multiplying by 100.

values are associated with low MUI scores, which might suggest that meaty parts of the seal carcass were taken away from Karlebotn for consumption elsewhere. However, there is a reasonably strong negative correlation between seal bone density and the MUI (r_s= -0.49, P=0.03) as well as between density and the MMUI (r_s=-0.46, P=0.03). It is therefore not surprising that at a site like Karlebotn, where MAU has a significant positive correlation with density, it might also have a significant negative correlation with MUI and MMUI.

Table 7.4 Meat utility index and modified meat utility index for phocid seals (after Lyman *et al.* 1992: tables 3 & 6)

Element	Average flesh weight (g)	% MUI	% MMUI
head	1520	27.4	31.6
cervical	1989	35.8	35.8
thoracic	1380	24.9	62.4
lumbar	1827	32.9	38.7
pelvis	2473	44.5	44.5
rib	5553	100.0	100.0
sternum	151	2.7	51.4
scapula	1098	19.8	59.9
humerus	595	10.7	15.2
radius/ulna	265	4.8	7.7
femur	249	4.5	30.5
tibia/fibula	918	16.5	16.5

Scatterplots of seal MAU versus the meat utility index are shown in Figures 7.12 and 7.13. There are two basic patterns to these distributions. One group of houses displays an even horizontal spread of elements, most of which cluster at low MAU values. Few elements at these sites have high MAU's. This pattern is illustrated at Gressbakken 3 (Figure 7.12) and also applies to Gressbakken 4, Gressbakken 5, Høybukt 2 and Høybukt 4. The second group have a similarly even horizontal spread of elements, but are more evenly distributed vertically. This pattern is shown at Karlebotnbakken (Figure 7.13) as well as at Bergeby 18, Advik B and Gressbakken 23. None of these scatter plots resemble any of the utility strategies discussed by Binford (1978).

Neither Lyman *et al.* (1992) nor Diab (1998) found any sites with a strong correlation between seal MAU and either %MUI or %MMUI. (Although Lyman *et al.* consider a correlation of r_s=-0.58, P=0.05 between ringed seal and %MMUI at a single arctic

quarmang dwelling to be strong and significant). Lyman *et al.* (1992) and Diab (1998) cite ethnographic evidence from the Canadian arctic indicating that in most cases, complete seal carcasses are returned to residential sites where they are butchered and shared out or stored. Their streamlined shape makes seals easy to drag across ice, through water, or over land, facilitating the transport of whole seals. The fact that Lyman (1992) did not find any significant differences in body part representations between infant harbour seals (weighing roughly 6-7 kg) and adult male Steller's sea-lions (weighing roughly 900 kg) at archaeological sites on the Oregon coast, suggests that even very large pinnipeds may have been transported whole. Given the strong probability that complete seal carcasses were introduced to a site, the patterns of body part distribution may not correlate with the meat utility index because they are not "reflective of primary processing and transport, but rather of taphonomic processes that affected skeletal parts during and after residential site occupations. Such processes include caching, dog feeding and natural post-depositional processes" (Lyman *et al.* 1992: 544). Diab (1998: 2) adds group sharing to the list of taphonomic factors.

A factor not considered by the seal meat utility indices is the role of blubber in determining units of transport and distribution. At high latitudes, where carbohydrates are scarce, human physiology demands that people maintain a critical level of fat relative to protein in their diet (Cachel 1999). Seals may have been valued most for the fat they provided, with meat a secondary consideration. This would be particularly true if fish, which are very low in fat, formed a large part of the diet at a given time of year. Many cultures have specific rules about which pieces of blubber are apportioned with which parts of the seal carcass (e.g. Balikci 1970: 134-135; Drucker 1950: 281-282). However, as blubber is often removed as a whole before any of the meat, or left as large pieces attached to much smaller units of meat and bone, it is difficult to discuss how it might have affected bone distribution and disposal.

7.2.5 Seal skulls and symbolic behaviour

As illustrated above, density-mediated destructive processes such as dog feeding and natural post-depositional factors, do not provide a satisfactory explanation for most of the seal element distributions in the Varanger assemblages. Nor does the meat utility index provide any obvious answers in terms of selective transport. There are, however, certain trends suggestive of human behaviour. Gressbakken 3, 4, and 5 stand together as

a unit, with similar patterns of seal disposal in the middens at all three houses. Most notably, the three share a heavy dominance of skull bones; crania and mandibles. There are other geographically wide-ranging examples from the literature of seal assemblages where crania are roughly twice as numerous as any post-cranial element (Lyman 1991; Rowley-Conwy & Storå 1997; Whitridge 1990). This phenomenon may relate to the ease of identifying cranial fragments compared to those from the post-cranial skeleton (Lyman *et al.* 1992). Differential preservation may also play a role. Auditory bullae are better represented than any other part of the seal cranium at the Varanger sites, probably because their compact shape makes them less likely to fragment than the rest of the skull. Bullae may also preserve better than many post-cranial elements. Unfortunately, Chambers (1992 in Lyman 1994: 248) does not provide any bone mineral densities for seal crania, making it impossible to assess their ability to withstand destructive processes relative to other elements.

Though crania are often dominant in seal assemblages, this pattern is by no means universal. There are many sites where crania form less than 50 %MAU (e.g. Park 1998; Savelle 1984, 1987), suggesting that while all of the factors listed above may contribute to the representation of seal crania in archaeological assemblages, there is an extremely wide range of taphonomic histories. Interestingly, it is not just crania which are common at Gressbakken Nedre Vest, but all elements of the head (Figure 7.2). Mandibles are the second most frequent element at all three houses, suggesting that seal element representation is not merely a product of the good preservation and identifiability of crania but genuinely reflects a preponderance of seal heads in the middens. Atlas is also quite common at all three houses, far outnumbering any of the other vertebrae, and at Gressbakken 5 it shares the second place ranking with mandible. Atlas is less common at Gressbakken 3 and 4 than at Gressbakken 5, and this difference could indicate variation in butchery practices between the houses. Seal crania may have been removed along with the atlas on some occasions, without it on others. If this was the case, crania were more consistently butchered to include the atlas at House 5 than at the other two houses. Crania, mandibles and atlas vertebrae are particularly dominant at Gressbakken Nedre Vest, but they also have high %MAU values at the other Varanger sites. Either cranium, mandible or atlas is the highest ranking element in all of the Varanger assemblages except Gressbakken 23 and Karlebotn 1.

Ethnographic accounts from a wide variety of northern hunter-gatherers (e.g. Balikci 1970; Damas 1972; Drucker 1950; Gubser 1965; Tanner 1979) indicate a shared belief that animals have spirits, and that improper treatment of an animal carcass will offend its spirit and game will become scarce. What constitutes "proper" treatment of a carcass varies greatly from group to group, but can involve rules for butchery, consumption and disposal.

The indigenous populations of arctic North America traditionally believed that an *inua*, a soul or spirit, dwelled within every animal. If treated with respect, the *inua* of a hunted animal would return, ensuring continued hunting success. They also believed in a deity who controlled the sea animals and, if angered, would withhold them from human hunters (Birket-Smith 1959: 165). Ethnographic sources document numerous rules involving the handling of hunted animals and their meat, bones and skins, all designed to placate both the animal spirits and this deity. Many of these rules involve maintaining a separation between land animals and sea animals at all times. Among the Copper Eskimo, for example:

> Fresh caribou meat must never lie on the side platform of the snow house together with seal meat; cod must never be eaten with the blubber of a bearded seal; ... products of the land and the sea must never be cooked in the same pot at the same time; seal blood cannot be used for splicing arrows intended for caribou hunting; sealskin may not be sewn at the fishing creeks while the char are still running. Above all, caribou skin clothing cannot be sewn on the sea ice during the dark period of winter. (Damas 1972: 39)

Other rules from Alaska and the Canadian Arctic relate to particular species. When the Copper Eskimo left a campsite, they placed a caribou skull on the snow outside the dwelling facing in the direction they intended to travel (Dumas 1972: 39; Rasmussen 1932: 40). In the central Arctic, a dead ringed seal was shown respect by being given a drink of fresh water before it was butchered (Jenness 1922: 181; Rasmussen 1929: 184, 1931: 166). Maribeth Murray (1999) has compiled a list of ethnographic references to the ritual treatment of seal bones among these groups, some of which are listed below. The Inupiat attributed a special symbolic importance to seal heads. Seal skulls were piled in front of the dwelling so that their *inua* would be pleased and the seals would stay close to the coast. Further, the fracturing of seal skulls was not permitted (Murdoch 1892: 432). The Netsilik would collect the skulls of all killed seals before leaving a camp. These would be placed in a group on or near the ice, facing towards the next

camp so that the seals would be able to find it (Rasmussen1931: 168). In Alaska, the bones of the first seal or sea lion of the season were often thrown in the sea so that these animals would continue to return (Lantis 1947: 42-43).

The ethnographic record from the Northwest Coast of North America also contains references to the prescribed ritual treatment of hunted animals and their bones. Cultures along the entire length of the coast believed in a race of salmon people who lived under the sea (Drucker 1950: 283-284). The salmon people took human form in the sea, donning salmon cloaks to swim up the rivers each year in order to spawn. Though they appeared to die after spawning, their spirits went back to their villages under the sea, returning the following year in new cloaks. Salmon had to be treated carefully, for if their bones or guts were lost, they would not be able to return. Any disrespect was believed to anger the salmon and interfere with the run. Throughout the Northwest Coast, the first salmon catch of each season was associated with a ritual feast (Drucker 1950: 285). Among the Tsimshian, this involved the return of the salmon bones to the water (ibid). Many groups also had rituals associated with bear hunting, all of which focused on the bear skull. Allowing dogs access to bear bones was seen as highly disrespectful. Among the Tsimshian, bear bones were burned so that dogs could not chew them, and the skull was hung in a tree (Drucker 1950: 287). The Bella Coola placed bear heads in the woods facing east, the Kwakiutl defleshed bear skulls and hid them in the forest, and the Tlingit hid complete bear heads in the woods or boiled the flesh off them and placed them in the sea (ibid).

Adrian Tanner (1979) documented many of the social and symbolic behaviours of the Mistassini Cree of eastern Canada. The Mistassini believed that individual animals had a sprit, and that each animal species was associated with a particular spiritual being which controlled it (Tanner 1979: 114). Care was taken not to offend animal spirits or their spirit masters:

> A central attitude in the conduct of hunting is that animals are persons and that they must be respected. The rules of respect after the killing involve essentially taking care of all elements of the carcass, and not allowing anything to be thoughtlessly discarded. Thus blood and intestines are consumed, buried in the snow or fed to the dogs, bones are made into tools, hung in trees, put on bone platforms or put in a lake, and all uneaten meat is fed to the dogs or put in the fire. (Tanner 1979: 130)

In order to ensure the success of future hunting ventures, the Mistassini erected caribou and moose antlers on stumps and horizontal poles, and hung their scapulae in trees (Rogers 1972: 130). The skulls of small animals are also erected on these poles, oriented to face the rising sun (Tanner 1979: 171). Bones of most species were not fed to dogs and were placed on special cache platforms (Rogers 1972: 130). After a bear kill, the hide was carefully prepared, but was not used for a year. The bones were stored and in the spring the skull was fixed to a tree trunk overlooking the water (ibid).

There are also records of the Saami of northern Scandinavia and Russia engaging in ritual treatment animal bones. Leem's account from 1767 describes the repeated use of "altar sites", sacred places where offerings of animal bones were made (Leem 1808). In traditional Saami belief:

> Nature was perceived as animated by living powers and gods which it was important to respect. All creatures had a deity - *máddu* - which stood as protector for their species. Stones, mountains and lakes were also alive. Natural power was concentrated in certain locations, and these places had special meaning. Through offering ceremonies and other rules for respectful conduct, the spiritual connection between humans and natural powers was strengthened. By making offerings, nature's gift was symbolically returned and the balance maintained.
>
> (A. Schanche 1996: 16—my translation)

Recent surveys have revealed numerous deposits of reindeer and bear bones throughout Sweden and Norway, the product of Saami ritual behaviour in recent centuries (Iregren 1985; Kjellstrøm 1985). Many different kinds of reindeer bone deposits are documented in northern Sweden. These include individual bones, groups of skulls or antlers, single complete skeletons and multiple skeletons (Iregren 1985). These deposits occur in specially built cairns, alongside boulders and in natural openings in the rock. The present author has observed clusters of reindeer antlers, partial reindeer skeletons, and single and multiple reindeer skulls in crevices on the large slate terraces at Mortensnes in Varangerfjord. Between 250 and 300 Saami graves are also located on these terraces (A. Schanche 1996: 25).

In addition to the ethnographic evidence outlined above, there are archaeological examples suggesting that symbolic behaviour associated with animal bones was part of hunter-gatherer cultures in the past as well. The archaeological evidence is limited, and the cases outlined below are the only ones of which this author is aware. At the Dorset Palaeoeskimo site of Phillip's Garden in Newfoundland, harp seal crania were

concentrated within two pit features inside a dwelling. McGhee (1981) recovered five walrus mandibles and 5 polar bear skulls with mandibles from a single feature at Snowdrift village, another Dorset site in the Canadian Arctic. Holes have been documented in Steller's sea lion skulls from late Holocene sites in California (Heizer 1951) and Oregon (Lyman 1991). Lyman (1991) argues that they are incorrectly placed to represent killing blows, and it has been suggested that they represent some kind of ritual treatment (Lyman *et al.* 1992).

Naturally, one cannot draw direct parallels between historically documented and prehistoric use of animals. However, the ethnographic accounts indicate that symbolic treatment of animals and their remains is widespread among hunter-gatherers. Zooarchaeologists traditionally rely on functional, testable explanations for their data. The proliferation of taphonomic studies and evolutionary ecology approaches to the zooarchaeology of hunter-gatherers in recent years has strongly reinforced this trend (see Chapter 1). Symbolic behaviour is difficult to model and test scientifically. It is also hard to discern archaeologically, given the palimpsest nature of archaeological assemblages and the elusiveness of the symbols involved. There is a reluctance among modern zooarchaeologists to suggest that bone distributions on hunter-gatherer sites might be the product of symbolic behaviour. In the current climate, an attempt to publish such an idea in a major archaeological journal met with considerable resistance on the grounds that it suggested symbolic deposition of bird carcasses by hunter-gatherers (Jonathan Driver, pers. comm.).

In the course of this analysis, a surprising number of nearly complete harp seal crania were noted at Gressbakken Nedre Vest, some from very young individuals (Figure 7.14). Seven were identified from House 3, eleven from House 4, and one from House 5. The completeness of these examples is unusual, as crania are comprised of very thin bone, and generally become highly fragmented in archaeological contexts. There are several other examples of complete or nearly complete harp seal crania from the Varanger middens; seven from Bergeby 18, and one each from Karlebotnbakken, Kalkillebukta, Høybukt 2 and Høybukt 4. This may merely reflect the excellent preservation conditions in the middens. However, while auditory bullae are common, large fragments of other parts of the seal skull are extremely rare on most archaeological sites (Jim Woollett, pers. comm.). Bullae are obviously very resilient and preserve well, but the rest of the

seal cranium has a limited resistance to stress and generally breaks into small fragments. In several of the harp seal crania from Gressbakken Nedre Vest, the inter-palatine suture had not yet joined. The skulls of these young individuals were extremely thin and very unlikely to survive intact. If the skulls were deliberately buried in the middens, perhaps as a symbolic act of respect, they would have been protected from destruction. Unfortunately, information on the orientation of these skulls, which might have helped to support or refute this suggestion, was not recorded during any of the excavations. Because bones have traditionally been perceived only as economic indicators, such information has often been deemed unimportant.

Thus, there is an indication that seal skulls, in particular harp seal skulls, may have been consistently given special treatment at Gressbakken Nedre Vest, and occasionally at other houses as well, notably Bergeby 18. In this regard, it is interesting to note that crania feature prominently in both anthropological and archaeological examples of the symbolic treatment of animals by hunter-gatherers, as discussed above. There appear to be very strong, site specific trends of seal disposal at Gressbakken Nedre Vest. At Høybukt, the only other site with substantial faunal samples from more than one house, there is much larger variation between the houses. However, the Høybukt seal samples are relatively small (House 2 MAU=84; House 4 MAU=64) and they may not be as representative as the larger ones. Unfortunately, there is no other site where two or more Gressbakken-type houses have produced large enough seal bone samples to test whether the similarity between the Gressbakken Nedre Vest assemblages is a site-specific phenomenon.

7.2.6 Differential disposal in middens

Similarities and differences in seal element representation at each of the Gressbakken-type houses were examined above. It has also been illustrated that disposal of animal carcasses among historically documented hunter-gatherers is not random, and it is unlikely to have been so among past groups. Prescribed rules for the disposal of seal bones may be reflected in the spatial distribution of seal bones at each of the Varanger houses. Are there significant differences between the representation of seal elements on either side of the passage? Where the faunal samples from each half of the midden are large enough, the two halves will be compared. This includes Gressbakken 3, 4, and 5 as well as Bergeby 18.

In the case of Gressbakken 3, Gressbakken 4 and Bergeby 18, there is a reasonably good correlation between the seal element rankings on either side of the entrance passage, suggesting similar patterns of carcass disposal in both places. At Gressbakken 3, rho is very strong (r_s=0.79, P<0.001) and the distribution curves look similar (Figure 7.15). The only marked differences between the two curves occur at atlas and scapula, which are better represented in the north-west midden than the north-east one. The correlation between middens is somewhat weaker, though still significant at Gressbakken 4 (r_s=0.66, P=0.001). Here, too, the curves look very similar, though mandibles and upper forelimbs (scapula and humerus) are better represented in the north-west midden (Figure 7.16). The two middens at Bergeby 18 also correlate relatively well with each other (r_s=0.63, P=0.003). There are strong correlations between the element distribution in level 2 and level 3 of the south-west midden (r_s=0.89, P>0.001) and between the same levels in the south-east midden (r_s=0.84, P>0.001). All levels in each midden are therefore combined in this discussion. The most substantial differences between the two middens at Bergeby 18 occur at scapula and distal humerus, both of which are better represented in the south-east midden (Figure 7.17). Proximal humerus is also considerably better represented to the south-east of the house than to the south-west. Therefore, scapula is much better represented on the right side of the entrance passage (as approached from the sea) at all three houses. Humerus is also considerably better represented in the right-hand midden at Gressbakken 4 and Bergeby 18. This may suggest preferential deposition of upper forelimbs to the right of the entrance at all of these houses.

At Gressbakken 5, a much stronger argument can be made for the existence of spatial rules for the disposal of seal carcasses. Here, there is only a weak correlation between the seal element distributions in the two middens (r_s=0.43, P=0.03). Elements from the head dominate in the north-western midden, while post-cranial elements are far more prominent in the north-eastern midden (Figure 7.18). As table 7.5 illustrates, there are almost twice as many crania in the north-western midden as the north-eastern one, almost ten times as many mandibles, and six times as many atlas vertebrae. Conversely, there are more than twice as many humeri in the north-eastern midden, five times the number of pelves, and almost all other post-cranial elements are more numerous than in the north-western midden.

Table 7.5 MAU values for seal elements in the north-east and north-west middens at Gressbakken 5

Element	NE Midden	NW Midden
Cranium	36	62
Mandible	6	56
Atlas	6	36
Axis	6	2
Cervical	3.6	1.6
Thoracic	3.2	1.4
Lumbar	16.8	5.6
Scapula	16	17
Prox. Humerus	12	5
Dist. Humerus	18	6
Prox. Radius	19	10
Dist. Radius	8	8
Prox. Ulna	17	14
Dist. Ulna	9	5
Metacarpal	1.2	3
Pelvis	25	5
Prox. Femur	13	10
Dist. Femur	16	11
Prox. Tibia	15	11
Dist. Tibia	13	8
Metatarsal	9.4	7
TOTAL	**269.2**	**284.6**

The marked predominance of crania, mandibles and atlas vertebrae in the north-western midden suggests a tendency for people to deposit seal heads in the north-western midden (on the right side of the entrance passage) as opposed to the north-eastern one. As discussed above (section 7.2.5), the atlas appears to have been removed with the head more consistently at Gressbakken 5 than at either of the other houses at Gressbakken Nedre Vest. The clearly patterned disposal at this house may relate to the larger percentage of ringed seal here than at Gressbakken 3, Gressbakken 4 or Bergeby 18. While positively identified harp seal crania are evenly distributed on either side of the entrance at Gressbakken 5, those of ringed seal are four times more numerous in the north-west midden than in the north-east (MAU=16 vs. MAU=4). Perhaps disposal of ringed seal was more strictly prescribed than that of harp seal.

There are strong similarities in the patterns of seal body part representation at the three houses at Gressbakken Nedre Vest, however House 5 is unique in having a much larger number of head bones in the north-western midden than the north-eastern one. While there may have been spatial rules for the disposal of upper forelimbs at Gressbakken 3

and 4, this patterning is not as distinct as at House 5. Unlike at House 5, head elements are relatively evenly apportioned between the two middens at Houses 3 and 4.

7.2.7 Summary

This exploration of the representation of seal elements in the Varanger middens has revealed similarities and differences both between and within sites. The positive correlation, in some cases fairly strong, between MAU and bone mineral density at all of the houses suggests that non-human destructive processes have left their mark on the assemblages. Given this, and the almost universal return of whole carcasses to residential sites among living cultures, it is concluded that seals were returned to the Varanger sites whole. The lack of correlation between seal MAU and either the meat utility index or modified meat utility index supports the notion that carcass parts were not differentially transported. The patterns of seal element distribution are at least partly the result of human distribution and disposal. This is best illustrated at Gressbakken Nedre Vest, where the strong similarities between the houses suggest shared rules for the handling of a seal carcass. Similar rules may also have been in effect at Bergeby 18. There seems to be an emphasis throughout the whole region on bones from the seal head. These may have received special treatment, with specific practices relating to how and where they were disposed. It has been argued that the importance of seal heads in these assemblages may reflect their deliberate deposition in the middens as part of a cultural belief that this part of the skeleton must be given particular respect. Prescribed behaviour in relation to the seal skull is further illustrated at Gressbakken 5 where seal skulls and atlas vertebrae predominate to the north-west of the house while post-cranial elements are dominant to the north-east.

7.3 Reindeer Body Part Representation

Reindeer, though the most important terrestrial mammal at most of the Varanger sites, does not occur in large numbers anywhere, which emphasises the marine focus of the economy. Only four of the excavated terminal YSA houses have reindeer bone samples of over 50 MAU: Gressbakken 3, Gressbakken 4, Karlebotn and Bergeby 18. These four will be discussed below, though the results from Gressbakken 4 (MAU=58) and Bergeby 18 (MAU=56) must be viewed with caution since they border on being too small to produce meaningful results. Table 7.6 lists the rho values comparing the

reindeer elements at each of these houses with each other and with deer bone mineral density from Lyman (1984).

There is a strong correlation between the reindeer element distributions at the two Gressbakken houses (r_s=0.76; P<0.001). Although they have very different values for distal humerus and proximal radius (Figure 7.19), the remainder of their plots look very similar. Axial elements are scarce, as are proximal humerus, distal metacarpus, pelvis and both proximal and distal femur. At both Bergeby 18 and Karlebotn 1, crania and mandibles are better represented than at Gressbakken (Figure 7.19). However, the element distributions from Bergeby and Karlebotn do not correlate well with each other (r_s=0.49; P=0.03). Bergeby's only strong correlation in terms of reindeer body part distribution is with Gressbakken 3 (r_s=0.64; P=0.004). Like Gressbakken 3, it has large numbers of scapulae and proximal radii, with few proximal humeri and distal metacarpi. Unlike any of the other houses, it has a relatively large percentage of proximal femora. The ranking of reindeer elements from Karlebotn correlates well with that from Gressbakken 3 (r_s=0.66; P=0.003) and Gressbakken 4 (r_s=0.64; P=0.004). As at Gressbakken, scapula and distal tibia are well represented, while proximal humerus and both proximal and distal femur are scarce (Figure 7.19).

Table 7.6 Correlation of ranked reindeer elements at each house with rankings at other houses and with bone mineral density

Gressbakken 3	**r_s=0.64*** P=0.004			
Gressbakken 4	r_s=0.44 P=0.04	**r_s=0.76*** P<0.001		
Karlebotn 1	r_s=0.49 P=0.03	**r_s=0.66*** P=0.003	**r_s=0.64*** P=0.004	
Bergeby 18	r_s=-0.05 P=0.42	**r_s=0.64*** P=0.004	r_s=0.44 P=0.04	r_s=0.49 P=0.03
	Density	**Gress-bakken 3**	**Gress-bakken 4**	**Karlebot n 1**

*indicates particularly strong (greater than 0.60) statistically significant r_s values

7.3.1 Differential preservation

Some of the patterning described above can perhaps be ascribed to differential preservation of reindeer skeletal elements. Distal tibia, for example, which has % MAU

values of 100 at both Gressbakken 4 and Karlebotnbakken, is one of the densest bones in the skeleton, after metapodi and mandibles. Distal metacarpi and metatarsi are, however, scarce at all four houses, despite their high bone mineral density (Figures 7.20 to 7.23). There are currently no bone mineral density measurements available for reindeer, so this discussion relies on Lyman's (1984) values for deer[3]. As in the case of seal, the density values employed for each reindeer element correspond as closely as possible to the zone of that element which was used to calculate MNE and MAU. Gressbakken 3 is the only house with a strong correlation between bone mineral density and reindeer element representation (r_s=0.64; P=0.004). Gressbakken 4 and Karlebotnbakken have weaker positive correlations, while at Bergeby 18 there is absolutely no correlation between bone mineral density and element representation (Table 7.6). This suggests that although Gressbakken 4 reindeer bones display more carnivore gnawing than those from the other houses (section 5.2.3), carnivore activity has not significantly altered the representation of skeletal elements.

Part of the weak correlation between bone mineral density and element representation may relate to the fact that deer bone mineral density figures were used to approximate those of reindeer. This seems unlikely since there is a very strong correlation (r_s=0.87; P<0.001) between the bone mineral density figures for deer (*Odocoileus virginianus* and *O. hemionus*) and pronghorn antelope (*Antilocapra americana*), two gracile ungulates whose skeletal structures resemble that of reindeer. Bone mineral densities for both deer and pronghorn, however, differ greatly from the much larger, more heavily built bison (*Bison bison*) (Figure 7.24). Rho for deer and bison bone mineral densities is only 0.15 (P=0.27) and that for pronghorn and bison only 0.11 (P=0.32). This suggests that bone mineral density measurements for species with similar anatomical structure are significantly correlated and that, in the absence of data for reindeer, deer bone mineral densities provide a reasonable substitute[4]. Density does not appear to be the only factor influencing reindeer skeletal element representation.

[3] Lyman (1984) derived his deer bone mineral density values using photon absorptiometry measurements on black-tailed deer (*Odocoileus hemionus columbianus*), mule deer (*Odocoileus hemionus hemionus*) and white-tailed deer (*Odocoileus virginianus leucurus*).

[4] Elkin (1995) has also shown strong similarities between the bone densities of three camelid species (*Llama glama*, *L. guanicoe* and *L. vicugna*). Rho ranges from 0.79 to 0.86 with P less than 0.001.

7.3.2 Differential transport

As mentioned in section 7.2.4, utility indices are often used by zooarchaeologists to discuss the selective transport of carcass parts from a kill site to a base camp. Binford (1978) was the first to develop a series of utility indices for caribou/reindeer[5]. These indices were based on his observations of Nunamiut hunting, butchering, processing and storage of caribou. Binford also butchered an adult male caribou and recorded gross weight, bone weight, marrow cavity volume and the amount of bone grease for each part of the carcass. He used these figures to develop a meat utility index (MUI), a marrow index (MI) and a white grease index (WGI). He then combined the three indices through a series of calculations to produce a general utility index (GUI). Binford recognised that certain skeletal parts with a relatively low general utility were attached to other parts with much higher utility. Such low utility parts were often transported as "riders" along with the adjoining high utility ones. Binford therefore adjusted the GUI to account for these riders and produced his final utility index, the modified general utility index (MGUI).

Metcalfe and Jones (1988) argued that the calculations involved in Binford's derivation of the MGUI were over-complicated. They developed an alternative called the food utility index (FUI) by simply "scal[ing] variation in the amount of meat, marrow, and bone grease associated with different caribou body parts" (Metcalfe & Jones 1988: 1). Their FUI is based on Binford's original weights and ranks skeletal elements almost identically to Binford's MGUI (r_s=0.98; P>0.001). Reindeer bone breakage patterns indicate that bone marrow extraction was not intensive on the Varanger sites, and bone grease extraction was non-existent (section 5.2.2). Binford's MUI, which is based solely on the meat weight associated with each skeletal element, will therefore be employed in the following discussion. MGUI will also be used for comparison. Given the strong correlation between MGUI and FUI, the relationship between element representation and MGUI is a good indication of that between element representation and FUI. The values for caribou MUI, MGUI and FUI are presented in Table 7.7.

Binford (1978) proposed three different transport strategies. According to the "bulk" strategy, as many elements as possible were returned to the base camp from the kill site,

with little regard to their utility. Under a "gourmet" strategy, only the highest utility elements were transported from the kill site to the base camp. An "unbiased" strategy would see a direct correlation between bone utility and element frequency. The three strategies produce complementary assemblages on camp sites and kill sites. The graphical representation of a utility model at a camp site has a mirror image, the inverse utility model, at the kill site (Figure 7.25).

Table 7.7 The caribou meat utility index (MUI), modified general utility index (MGUI) and food utility index (FUI).

Element	MUI (Binford 1978: 23)	MGUI (Binford 1978: 74)	FUI (Metcalfe & Jones 1988: 492)
antler	-	1.02	1
cranium	18.1	8.74	235
mandible (with tongue)	31.1	30.26	1,600
mandible (w/o tongue)	11.4	13.89	590
atlas	10.1	9.79	524
axis	10.1	9.79	524
cervical vertebrae	37.0	35.71	1,905
thoracic vertebrae	47.2	45.53	2,433
lumbar vertebrae	33.2	32.05	1,706
pelvis	49.3	47.89	2,531
ribs	51.6	49.77	2,650
sternum	66.5	64.13	3,422
scapula	44.7	43.47	2,295
humerus	28.9	prox: 43.47	prox: 2,295
		dist: 36.52	dist: 1,891
radio-cubitus	14.7	prox: 26.64	prox: 1,323
		dist: 22.23	dist: 1,039
metacarpal	5.2	prox: 12.18	prox: 461
		dist: 10.50	dist: 364
femur	100.0	prox: 100.00	prox: 5,139
		dist: 100.00	dist: 5,139
tibia	25.5	prox: 64.73	prox: 3,225
		dist: 47.09	dist: 2,267
metatarsal	11.2	prox: 29.93	prox: 1,003
		dist: 23.93	dist:792

There is no clear association between the reindeer MAUs and either the meat utility index (MUI) or modified general utility index (MGUI) developed by Binford for caribou (see Table 7.8). The relationship between MAU and both MUI and MGUI at Bergeby 18 does not resemble any of the utility strategies proposed by Binford (Figure 7.26).

[5] "Caribou" and "reindeer" are merely names for regional populations of the species *Rangifer tarandus* (Burch 1972). Caribou occupy northern North America and Greenland, reindeer northern Scandinavia and Russia.

When MAUs are plotted against both MUI and MGUI at Gressbakken 3 (Figure 7.27), Gressbakken 4 (Figure 7.28) and Karlebotnbakken (Figure 7.29), the result is an L-shaped curve corresponding roughly to an "inverse bulk utility strategy". Such scatterplots are generally typical of kill sites, where the higher utility elements have been removed to a residential camp elsewhere. Bryan Hood has argued, based on the lithic assemblages from the Gressbakken-type houses, that reindeer were not hunted directly from these coastal sites. He believes that the paucity of bifaces and biface thinning flakes indicates logistical mobility, with hunters venturing away from the base camps to pursue reindeer (Hood 1992: 246). Moreover, the nature of these sites, with their large house remains, suggests that they were not temporary kill sites. Their main occupation probably occurred during winter and spring. People hunting reindeer in the autumn or winter would presumably return the desirable parts of the carcass to their winter dwellings, i.e. the Gressbakken-type settlements. The patterns could indicate a spring hunt, with removal of the important meat elements, perhaps after drying, to a summer camp elsewhere. Season of death information provided by reindeer tooth sections from Gressbakken Nedre Vest suggests that the main reindeer hunt occurred around the time of the spring migration, with a secondary hunt during the autumn migration (Appendix C).

Table 7.8 Correlation of reindeer skeletal element representation (%MAU) with Binford's (1978) MUI and MGUI

	MUI	MGUI
Gressbakken 3	r_s=-0.35 P=0.06	r_s=0.07 P=0.37
Gressbakken 4	r_s=-0.07 P=0.38	r_s=0.23 P=0.16
Karlebotn 1	r_s=-0.04 P=0.45	r_s=-0.16 P=0.28
Bergeby 18	r_s=0.04 P=0.45	r_s=-0.10 P=0.36
Density	r_s=0.04 P=0.45	r_s=-0.10 P=0.36

However, this "lack of fit" between the reindeer element representations and the expectation of carcass transport to a base camp, may relate to the major underlying assumption of meat and other utility indices; that animals were hunted primarily as a source of food (but see Savelle 1997). The small numbers of reindeer bones in the

Varanger assemblages indicate that reindeer did not play a major role in the diet, though they doubtless provided a welcome change from fish and seal. Yet reindeer bone and antler dominate among the artefact assemblages, suggesting an importance for reindeer not indicated by the species lists.

7.4 Artefacts of Bone and Antler

One of the characteristic features of the terminal Younger Stone Age assemblages from Varanger, is the large number of bone and antler artefacts (B. Olsen 1994; Renouf 1989; Schanche 1994; Simonsen 1963). Antler is particularly prominent among the artefact assemblages, as are reindeer longbones. Some of the antler burr fragments on the sites had been shed naturally, suggesting that antler was collected specifically as a raw material as well as being brought to the sites as part of hunted carcasses. This further emphasises the importance of antler as a raw material. Reindeer bone and antler were used to create a wide variety of functional artefacts as well as some decorative items. Bird bones were also used for a limited range of artefact-types. Marine mammal bones were rarely worked, and tended to be used in the production decorative rather than functional items.

Table 7.8 lists all of the artefact types made of land mammal bone and antler, bird bone and sea mammal bone. Antler tools include fish hooks, barbs, points, harpoons, daggers, chisels and combs (Figures 7.30 to 7.35). Almost all of the identifiable antler is reindeer, though a single fragment of elk (*Alces alces*) antler was recovered at Bergeby 18. Given that elk bones are extremely rare in the assemblages, most of the unidentified antler is probably reindeer as well. Antler was worked using the "chocolate block" technique, whereby it was snapped along a groove scored into its surface (Figures 7.36 and 7.37). It was then cut and abraded into a variety of forms. Reindeer longbones were used to make scrapers, awls and "daggers" (Norwegian *dolk*) (Figures 7.38 to 7.40) and reindeer cheek teeth were occasionally turned into beads or pendants by boring a hole through the root. The many unidentifiable "large terrestrial mammal" longbones which were worked into points, barbed points, leisters, and chisels were almost certainly also reindeer, as it was the only terrestrial mammal of this size that was identified with any frequency. Other possibilities such as bear (*Ursus arctos*) and elk were extremely rare in the identified faunal material. Bird long bones were used to make beads, tubes, awls and

needles (Figures 7.41 and 7.42). Sea mammal bones were rarely used to make artefacts. The most frequently occurring artefacts made of sea mammal material were harp seal and ringed seal canine tooth beads.

Table 7.8 Artefact types made of land mammal, bird and sea mammal bone at all study sites combined

Land Mammal		Bird	Sea Mammal
Bone	**Antler**	**Bone**	**Bone**
88 polished/abraded	205 preforms	32 beads	19 canine tooth
60 points	32 barbs	31 needles	beads
42 chisels	29 fish hooks	10 points	3 incised
26 incised	25 harpoons	7 tubes	decoration
decoration	25 points	7 polished/abraded	1 pendant?
13 preforms	23 combs	4 awls	1 preform
12 molar/premolar	21 leister prongs	3 buttons?	1 ornamented
beads	15 abraded	1 drilled hole	1 abraded
10 incisor tooth	9 chisels	1 preform	1 object of
knives	8 daggers		unknown function
9 scrapers	6 decorated		
9 awls	5 awls		
7 daggers	2 human figurines		
5 needles	2 U-shaped objects		
6 leister prongs	1 T-shaped object		
4 canine tooth beads	1 animal figure		
3 harpoons			
3 drilled holes			
1 net weight			
1 fish hook			
1 barb			
1 comb			
1 cylinder			
1 animal figure			
1 pendant?			
1 button?			

Table 7.9 lists the raw materials used to produce the bone and antler artefacts for any site with a sample of 30 or more. Not included are Gressbakken 5 with 19, Advik B with 10, Kalkillebukta 17 with 6, Høybukt 2 with 12, and Høybukt 4 with 10. The top part of the table shows whale, dolphin, seal and walrus, sea mammals which are represented by only small numbers of artefacts. Birds are better represented among the artefacts, primarily in the form of long bone segments which were scored and snapped at

Table 7.9 Raw material selection for bone and antler artefacts at Gressbakken-type houses around Varangerfjord

	Species and Element	Gress-bakken 3	Gress-bakken 4	Advik J	Berge-by 18	Karle-botn 1
Sea Mammals	WHALE (*Cetacea*)					
	vertebra	0	1	0	0	0
	rib	0	1	0	1	0
	unknown bone	0	0	0	0	1
	TOTAL WHALE	**0**	**2**	**0**	**1**	**1**
	DOLPHIN (*Lagenorhynchus sp.*)					
	tooth	0	0	0	1	0
	rib	1	0	0	0	0
	TOTAL DOLPHIN	**1**	**0**	**0**	**1**	**0**
	SEAL (*Phocidae*)					
	canine tooth	1	1	1	0	12
	bacculum	1	0	0	0	0
	TOTAL SEAL	**2**	**1**	**1**	**0**	**12**
	WALRUS (*Odobenus rosmarus*)					
	canine tooth	**0**	**0**	**0**	**1**	**0**
Birds	BIRD					
	scapula	1	0	0	0	0
	coracoid	0	1	0	0	0
	humerus	1	1	0	0	0
	ulna	2	1	0	1	0
	carpometacarpus	1	0	0	0	0
	femur	0	1	0	0	0
	tibiotarsus	1	2	0	0	0
	fibula	5	5	0	0	0
	longbone	24	15	0	5	7
	TOTAL BIRD	**35**	**26**	**0**	**6**	**7**
Land Mammals	BEAVER (*Castor fiber*)					
	incisor	**3**	**1**	**0**	**0**	**6**
	CARNIVORE					
	canine tooth	**2**	**1**	**0**	**0**	**0**
	BEAR (*Ursus arctos*)					
	canine tooth	**0**	**0**	**0**	**0**	**1**
	REINDEER (*Rangifer tarandus*)					
	antler	110	79	10	7	10
	tooth	0	1	0	0	12
	thoracic	0	1	0	0	0
	scapula	3	8	2	1	0
	humerus	0	1	0	0	1
	radius	3	0	0	0	3
	ulna	7	4	1	1	1
	femur	0	0	0	0	1
	tibia	0	0	0	1	1
	calcaneum	1	0	0	0	0
	metapodial	0	2	0	0	2
	TOTAL REINDEER	**124**	**96**	**13**	**10**	**31**
	ELK (*Alces alces*)					
	antler	**0**	**0**	**0**	**1**	**0**
	REINDEER or ELK					
	antler	**82**	**65**	**9**	**3**	**14**
	LARGE TERRESTRIAL MAMMAL (probably reindeer)					
	cranium	0	0	0	0	0
	rib	2	2	0	2	1
	scapula	2	4	0	0	3
	longbone	75	56	13	9	22
	TOTAL LTM	**79**	**62**	**13**	**11**	**26**
	UNKNOWN					
	bone or antler	22	31	1	4	30
	TOTAL	**350**	**288**	**37**	**38**	**128**

both ends, some of which were then decorated along their length with rings or a spiral (Figure 7.42).

Land mammals make up the lower portion of the table, and the bulk of the assemblage. A single bear tooth pendant, several fragments of unidentifiable carnivore (wolf?) tooth pendants, and several beaver incisors worked to form cutting edges were found. As was a single piece of elk antler which had been scored and snapped as part of the early stages of artefact manufacture. The remainder of the artefacts, most of them functional tools such as fish hooks, harpoons and scrapers, are constructed using reindeer antler (or antler which could not be positively identified but is probably reindeer) and reindeer (or reindeer-sized land mammal which is probably also reindeer) bone. The few reindeer tooth beads and antler combs appear to have been purely decorative.

The representation of various species among the unworked bone indicates that the main economic activities taking place on these sites were fishing and sealing, and the artefact inventory supports this conclusion (Schanche 1994; Simonsen 1961). Among the bone and antler artefacts, fish hooks, leister prongs, net sinkers, loose barbs and harpoons can be reliably attributed to fishing and sea mammal hunting. Scrapers and needles would have been used for working hides, chisels for wood-working. Combs and beads were presumably used for personal ornamentation. Bone points, daggers and "T-shaped artefacts" are more difficult to assign to specific functions.

The selection of reindeer antler and bone for artefact production probably occurred for practical reasons. Antler is strong and easy to work, which doubtless contributed to its popularity. Reindeer longbones are longer, straighter, and have a thicker cortex than those of seals and other sea mammals, making them far better suited to tool manufacture. Reindeer would also have been valued for their long sinews and their hides, which could have been used to produce such items as clothing, bedding and tents. In fact, given the large amount of meat and fat provided by seals, and the availability of fish, food value may not have been the primary consideration in determining which parts of the reindeer carcass were returned to the site. Instead, portions of the carcass might have been selected based on their utility as raw material. This would help to explain why elements such as femur, which has high meat utility but is rarely used in artefact production, are far less frequent than elements with lower meat utility that are commonly used to make artefacts (e.g. scapula and ulna).

Thus, though they did not make a major contribution to the diet, reindeer nonetheless played a crucial role in maintaining the primary marine economy. Their bone and antler were valued raw materials in the production of artefacts needed for fishing and seal hunting. Fish hooks, barbs used in composite fishing tools, leister prongs and harpoons were all regularly produced using reindeer bone and antler. The high demand for these raw materials appears to have influenced the selection and transport of reindeer body parts to the sites in question. Element representation appears to be more closely related to their utility in terms of artefact manufacture rather than any measure of their food value.

7.5 Sea and Land

Thus, there seems to be a fundamental difference in the way that seal and reindeer were utilised on the Varanger sites, beyond the obvious difference in their numbers. Seals appear to have been returned to the sites whole as large packages of meat and blubber. They must have played a crucial role in the diet, given the importance of fat in cold climates and the considerable size of adult harp seals. Adult males average 135 kg, adult females 120 kg (Sivertsen 1941).

Reindeer, on the other hand, appear to have been transported back to the base camp in smaller packages. The representation of skeletal elements does not suggest any attempt to maximise the amount of food. Several alternative explanations suggest themselves here. Perhaps the meatiest parts of the reindeer carcass were largely consumed at the kill site, or were transported away from the Gressbakken-type houses to more ephemeral settlements elsewhere. Alternatively, the occupants of the sites may have scavenged reindeer carcasses, rather then actively hunting the animals, in which case carnivores would have removed the important meat-bearing elements. A further possibility is that the meat-bearing bones were disposed of somewhere other than the middens and did not preserve, so that the reindeer bones in the middens represent "industrial" rather than food waste. Each of these patterns of disposal stands in opposition to that of seal, a more commonplace food animal which was returned to the sites whole. Whatever the case, a contrast exists between the role of seal as a dietary staple, and the importance of reindeer in providing raw material and perhaps also a valued but occasional source of food.

Yet seal did not feature solely in the diet of the late Younger Stone Age occupants of Varangerfjord. It played an important role in their ideology as well. Social rules appear to have governed the deposition of seal bones in the middens. At Gressbakken 5, there was a strong tendency to separate seal crania from post cranial elements in the middens. There may also have been rules about the disposal of seal upper forelimbs at Gressbakken 4, Gressbakken 5 and Bergeby 18. The preponderance of seal head bones and the presence of near-complete crania in all of the middens, particularly those at Gressbakken Nedre Vest, speaks of special treatment for seal heads throughout the region. There are large samples of seal bones from these sites, which permit the detection of such behaviours. It is unlikely that seals were the only animals afforded special treatment, and many other such activities doubtless go undetected. The hunting, consumption and disposal of many food species were probably inextricably linked with spiritual belief.

CHAPTER 8

CONCLUSION: LATE YOUNGER STONE AGE SOCIAL ORGANISATION IN VARANGER

8.1 Egalitarian or non-egalitarian?

We now return to the question of late Younger Stone Age social organisation in light of the analysis presented in the previous chapters. Were permanent social hierarchies in place, or was there a system of social equality? The substantial house remains of the period and the evidence for potentially year-round occupation of sites, at least in the inner-fjord, suggest a high level of sedentism. However, limited residential mobility is not inextricably linked with a non-egalitarian social structure, as many ethnographically documented Arctic hunter-gatherers demonstrate. For example, the Nunamiut establish long-term base camps within a limited region of Anaktuvuk pass and yet maintain an egalitarian social organisation (Binford 1978; Gubser 1965).

8.1.1 Mobility

Early interpretations of the faunal remains from Gressbakken sites over-estimated the degree of seasonal mobility (Simonsen 1961, 1974; H. Olsen 1967). However, the strong sedentary emphasis of the currently accepted model (first proposed by Renouf 1981, 1989; see figure 3.6) is somewhat misleading. Renouf (1989) demonstrates that the different food species available along the Varangerfjord coast combine to create a year-round food supply. She also shows that the seasonal indicators in the middens[1] potentially span the entire year at many of the Varangerfjord sites. However, while this may indicate year-round occupation, the same range of species could be found on sites occupied only for the winter-spring season (see Chapter 3.6.2).

The Gressbakken-type settlements were unquestionably occupied during the spring. The largest concentration of food resources in Varangerfjord occurred (and still occurs) in spring. The large numbers of harp seals and ringed seal pups in the late YSA middens, and the predominance of cod among the identified fish species, indicate intensive harvesting of resources during the spring months. The prehistoric occupants of the fjord must have taken advantage of this "food glut" to sustain them during times of the year

when food was less readily available. Seal oil was likely rendered and cached at the Gressbakken-type sites for use during the winter. Dried seal meat and dried fish could also have been stored.

The summer season might have meant longer forays from the coastal base camps. The shallower house depressions, thin midden deposits, and large percentages of saithe at Kalkillebukta suggest that it served as a summer fishing camp. The large number of house structures may indicate the summer aggregation of several different winter communities, or may simply reflect a large number of seasonal re-occupations of the site by a single community group. In either case, the site suggests seasonal migrations by entire households. No such sites have yet been found in the inner-fjord area, and it remains uncertain whether Kalkillebukta was utilised seasonally by groups from the inner fjord, or whether it represents part of a settlement pattern unique to the outer fjord. Task groups or entire communities might also have made short journeys to salmon rivers. However, if salmon were exploited, they were either consumed only at the salmon-fishing camps, or were returned to the Gressbakken-type sites as boneless fillets leaving no bone evidence in the middens. Logistical forays might also have been made to the bird colonies to hunt birds or collect eider down. Dolphin hunting was also an important summer activity, which would have been carried out from the main coastal settlements.

Renouf has argued (1989: 221-225) that all parts of the reindeer skeleton are represented in roughly equal proportions at the Gressbakken-type house sites, indicating that reindeer were returned whole to the sites. She therefore suggests that they were hunted directly from the coastal sites or indirectly through the use of small satellite camps nearby (Renouf 1989: 227). In fact, as demonstrated in Chapter 7, the reindeer skeletal representation suggests transport of selected elements from hunting camps some distance away. Reindeer hunting sites were most likely situated in the main migration corridor between the Tana River and the head of the fjord. This is suggested by the unusually large percentage of reindeer at Karlebotnbakken, the only excavated site within this corridor. Given the large concentrations of cod fish, ringed seal pups and harp seals at the coast during the spring, the main reindeer hunt probably occurred during the autumn

[1] Renouf's seasonal indicators include seasonally resident bird species and relative percentages of the main fish species.

migration from the Varanger peninsula to South Varanger and the forests around Lake Enare. Hunting may have taken place at a considerable distance from the coastal sites (perhaps up to 50 km). Ethnographic evidence indicates that autumn was also the main season of wild reindeer hunting among the Varanger Saami (Odner 1985; B. Olsen 1987). At this time, the males are in prime condition, displaying higher levels of body fat than at any other time of year (Burch 1972). Hunting parties probably established short term camps (as yet undiscovered) along the migration route in order to hunt the reindeer. Alternatively, though it seems unlikely given the relatively small amounts of reindeer bone at the Gressbakken-type sites, entire communities may have moved temporarily to the area to take part in large scale communal hunts. Either way, reindeer hunting may have involved the use of pitfall traps.

Winter probably meant a return to a more sedentary lifestyle, with most community members residing in the Gressbakken-type base camps at any given time. Whaling, either actively hunting small whales, or more likely exploiting stranded whales, would have peaked in January and February and would not have required the use of satellite camps. Ptarmigan and fresh-water fish could likewise be taken directly from the Gressbakken-type sites, as could fjord cod if the sea was not too rough. Dried food prepared during the spring and summer months was no doubt consumed at this time of year. In times of scarcity, small hunting parties may have ventured farther afield in search of food, but it is unlikely that large segments of the community would have relocated at this time of year.

The model of late YSA settlement patterns proposed above and illustrated in Figure 8.1 is similar to Renouf's model (1981, 1989) in that it includes few residential moves involving the whole community. However, while she stressed the sedentism of the coastal sites, this model places a stronger emphasis on the importance of logistical moves and includes some residential moves involving the whole community[2].

The number of Gressbakken-type houses visible on the surface of a given site ranges from two to thirty-two, and evidence of additional houses may have been destroyed. However, overlap between some house structures suggests that not all houses on any

site are contemporary. If sites consisted of between two and twelve occupied houses at any given time and were occupied by an average of five people, community size would have ranged between ten and sixty people. Over the course of any year, the group probably ranged over an area of maximum 100 km from the coastal base camps, with residential moves of less than 50 km.

8.1.2 Diet

The relative dietary importance of the animal taxa present in the Gressbakken-type middens was discussed in Chapter 4. For various reasons, including differential recovery and preservation between species, no attempt was made to calculate absolute dietary contributions. However, given the huge difference in size between, for example, a cod and a dolphin, it is difficult to imagine how much food each species represents when only the NISP counts are presented. Table 8.1 represents a series of approximate values for the percentage of the diet accounted for by different taxa. The values no doubt have a large margin of error, but are intended mainly as an heuristic device. They have been calculated only for the five houses with the largest faunal assemblages; Bergeby 18, Karlebotnbakken, Gressbakken 3, Gressbakken 4 and Gressbakken 5.

Table 8.1 Relative contribution of different taxa to diet

	Bergeby 18	**Karle-botn 1**	**Gressbak-ken 3**	**Gressbak-ken 4**	**Gressbak-ken 5**
Cod	5%	35%	20%	5%	2.5%
Harp seal	65%	10%	25%	30%	30%
Ringed seal	2.5%	0.5%	5%	2.5%	5%
Dolphin	*	*	15%	25%	5%
Small whale	*	*	15%	25%	30%
Reindeer	5%	10%	2.5%	2.5%	1%
Other	20%	20%	20%	20%	20%

* very small percentage included in "other" category

[2] Renouf argues for year-round occupation of many of the late YSA sites. According to the model proposed here, some sites may have been occupied year-round during some years, but during most years they would have been abandoned for short periods.

Table 8.2 Live weights used to calculate dietary contributions

Species	Weight (kg)[3]	Based on
Cod	15	Avg. young cod: 1.76 kg (Helland 1905: 596) Max. adult weight: ca. 19 kg (Daan 1974)
Harp seal	135	Avg. adult weight: 150 kg (Maxwell 1967)
Ringed seal	35	Avg. adult weight: 70 kg Newborn pup: 4-5 kg (McLaren 1962)
Dolphin	235 kg	White-nosed dolphin Avg. male: 250 kg Avg. female: 235 kg (Mitchell 1975)
Small whale	750 kg	Pilot whale Avg. female: 750 kg Avg. male: 2000 kg (Sergeant 1962)
Reindeer	95 kg	Avg. male: 110 kg Avg. female: 81 kg (Banfield 1974)

All of the excavated middens contain a wide variety of different species, but the bulk of each assemblage is comprised by a few main species: cod, harp seal, ringed seal and reindeer. Among the excavated houses at the site of Gressbakken, dolphins and small whales also play an important role. For the purposes of this exercise, it is estimated that these four (or six) main taxa contribute 80% of the meat consumed on each site, while all other fish, bird and animal species combine to form the remaining 20%. The values for each of the main taxa were calculated by multiplying the NISP[4] by the live weight (Table 8.2) of the species in question. At Gressbakken 3, 4 and 5, the fish values were doubled to compensate for the fact that no sieving took place at these sites. At all sites, the

[3] The cod weight was chosen from the higher end of the possible range (even though the spring cod migration generally consists of small individuals) since fish recovery and preservation are poor compared to mammals. The weight values also take into account the fact that roughly half of the ringed seal bones belonged to pups and that juveniles were found among the harp seals.

values for dolphin and small whale were halved. This was done because almost all of the elements identified to these taxa were vertebrae and ribs, both of which occur in large numbers in the cetacean skeleton, preserve well due to their size, and can potentially fragment into a large number of identifiable fragments. The NISP values for cetaceans are therefore likely to be far greater relative to MNI than for other species. Finally, the *NISP x meat weight* values were converted to percentages and rounded to the nearest five percent.

Table 8.1 reveals considerable variation in the dietary importance of the main food species at different houses. Cod were a larger part of the diet at Karlebotn 1 and Gressbakken 3 than at the other houses. Harp seal made an unusually large contribution to the food supply at Bergeby 18. Reindeer was a more common food at Karlebotn 1 than elsewhere, and dolphins and small whales were consumed in larger numbers at Gressbakken 3, 4 and 5 than at the other houses.

8.1.3 Large mammal remains

Despite the variation discussed above, the large mammal remains from Varangerfjord tend to suggest similarity rather than difference between the Gressbakken phase households examined in this study. The distribution of seal elements suggests that whole seal carcasses were returned to each site. The similarities between most of the households in terms of seal body part representation further suggest that seals were shared equally between community members, so that over time the representation of seal elements balanced out at each house. If status differences mediated the distribution of seal carcasses, one might expect low-ranking elements to accumulate in lower status dwellings, while higher-ranking elements would predominate in higher-status dwellings. The similarities in seal element representation are strongest between all three of the examined houses at Gressbakken Nedre Vest, which argues against a hierarchical structure between the residential units of that community. There are also strong correlations between the reindeer body part representations at Gressbakken 3, Gressbakken 4, Bergeby 18 and Karlebotn, suggesting equal division of the reindeer carcass between households.

[4] The NISP values used include both positive and probable identifications. Thus, the values for cod include "Gadids", those for reindeer include "artiodactyls" and the values for harp seal and ringed seal include a percentage of the "Phocids" based to their percentage among the positively identified seals.

The age breakdown of the hunted seal populations is likewise very similar at all of the examined households. Pups predominate among the ringed seals at all of the houses, with very few adults. Among harp seals, adults are more heavily exploited than pups. The difference in the age breakdown of the two species, not clearly identified by any previous analysis, suggests two different exploitation patterns. Young ringed seal pups were probably taken on the ice shortly after birth, when they rely heavily on camouflage for protection and make relatively easy prey. Adult ringed seal are much more wary and difficult to hunt. Harp seals rarely haul out while in Varangerfjord, and must have been hunted in the water from boats. Such a hunting strategy would have required considerable amounts of time, effort and skill, and larger animals would have provided a better return on this investment. It follows that larger harp seals would have been more highly valued as prey than harp seal pups.

There is some variation between the studied assemblages in the proportion of harp seal pups to adults. Gressbakken 3, Gressbakken 4 and Karlebotnbakken all display larger percentages of adults relative to pups than at Gressbakken 5 and Bergeby 18. This could reflect status differences between the houses; the first three houses perhaps controlling ownership of boats and/or having rights to the largest harp seals. However, it is unlikely that the number of "higher status" houses would outnumber the "lower status" ones. Moreover, strict social differentiation would probably have produced more pronounced differences between the houses. The proportions of adults and juveniles at each house vary depending on whether humerus or femur measurements are used to make the determination. In several cases, there is a difference of only ten percent between the percentage of harp seal pups in the first group (Gressbakken 3, Gressbakken 4 and Karlebotnbakken) and the second (Gressbakken 5 and Bergeby 18). Among egalitarian hunter-gatherers, all individuals are not necessarily equal. They need not possess the same amounts of food, goods, or authority. They do, however, share the same access to resources and opportunities to acquire prestige (Kelly 1995: 296; Woodburn 1982). Among the Okiek of Kenya, variations in hunting skill and the number of hunters living in each household have been documented to produce different body part profiles (Marshall 1994). As discussed above, there are strong similarities in the body part representation of both seals and reindeer at all of the Varanger houses. However, the

slight differences in the age profiles of harp seal are likely attributable to variation in both the composition of different households and their hunting skill.

8.2 Territoriality

The distribution of large mammal remains does not suggest marked status differences between households and argues against clearly developed social hierarchies. However, the faunal remains do suggest territorial behaviour on two levels. Schanche (1994, 1995) has suggested that the discontinuous distribution of Gressbakken-type houses around Varangerfjord indicates two distinct territorial groups, one concentrated in the inner-fjord and the other centred around the sub-fjords of south-Varanger. There appear to be broad regional differences between the two groups in terms of mobility. There are also indications of strongly territorial behaviour and controlled access to resources among the inner fjord settlements.

Excavations in the south-Varanger area have been limited and only two sites from the region are represented in this study; Kalkillebukta and Høybukt. The evidence from Kalkillebukta suggests that it was occupied on a short-term seasonal basis during the summer months. The midden deposits at all of the tested houses at Kalkillebukta are much thinner than at the inner-fjord sites. Saithe, a summer migrant to the area, comprises the vast majority of the fish remains in both of the excavated houses from the site. This stands in contrast to the inner-fjord sites where cod, available year-round and particularly abundant during the spring, is the most abundant fish species. There is a limited range of mammalian species on the site, and seals account for over 90% of all identified mammal bones. Kalkillebukta contrasts sharply with the contemporary sites in the inner-fjord, and appears to have been used less intensively than any of those sites. It was probably used as a seasonal fishing and sealing camp during the summer months.

Simonsen's description of the excavations at Høybukt suggests that the midden deposits there are considerably thicker than at Kalkillebukta (Simonsen 1963: 219-226). Cod is the best represented fish species at both excavated Høybukt houses, but the sample of fish remains is extremely small. As at Kalkillebukta, the mammalian assemblage contains a very limited number of species and is heavily dominated by seals. Overall, Høybukt bears a much stronger resemblance to the inner-fjord sites than Kalkillebukta does.

Based on the present evidence, there appears to have been a higher degree of sedentism in the inner-fjord than in south Varanger. In the inner fjord there was an extremely high level of what Binford (1980) termed "logistical mobility", where long-term base camps are provisioned by the short-term use of special-purpose resource procurement camps. In the outer fjord there appears to have been more diversity in the use and season of occupation of Gressbakken-type houses. There is also evidence for a higher level of residential mobility, which involves the movement of the entire base camp to a different resource patch (ibid). The summer occupation of Kalkillebukta raises questions as to where its residents spent the rest of the year. Perhaps sites like Høybukt and Kalkillebukta represent seasonal complements, with smaller settlements such as Høybukt occupied during the winter months and larger aggregations of population in summer fishing camps such as Kalkillebukta. Alternatively, sites such as Høybukt might have been occupied by relatively sedentary groups, while Kalkillebukta was the summer home of groups which spent much of the year in the interior. Given the very limited excavations to date in south-Varanger, and the lack of any extensive survey in the interior, all of these suggestions are highly speculative.

Though the inner-fjord appears to have formed a single large territorial group, there is evidence for marked territorial boundaries between each of the communities in this part of the fjord. Strongly territorial behaviour is suggested by the large proportions of whale, dolphin and ringed seal in Houses 3, 4 and 5 at Gressbakken Nedre Vest and also by the unusually large percentage of reindeer at Karlebotnbakken. All three of the examined houses at Gressbakken Nedre Vest contain unusually large percentages of whale and dolphin bones among the identified mammal remains. At Gressbakken Nedre Vest, whales and dolphins account for between 36 and 46% of all mammal remains, while they comprised less than 3% at all other sites (see Figure 4.31).

Directly north of Gressbakken there are today a series of small islands. Around 4000 BP, these would have been covered with water, and would have created a long, shallow foreshore particularly conducive to whale strandings. The modern Veines peninsula, which curves around to the north of Gressbakken, would have been cut off from the mainland by water (Figure 8.2). Just two kilometres to the west of Gressbakken, the shallow area between the island of Veines and the mainland would have formed a natural

shallow-water trap for whales and dolphins. The occupants of the site may have exploited the naturally stranded whales, actively netted small whales and dolphins in the shallow waters around the site, or driven them onto the shore using boats. All of these behaviours have been documented among the Varanger Saami. Lilienskiold (1698: 214) describes how white-nosed dolphins formed large groups in the spring and were driven into shallow waters where they were caught in nets or killed on the shore. Small whales, beached in the shallow waters at the mouth of Meskfjord (*Mies'kavuodna* in Saami), the more northerly of the two innermost branches of Varangerfjord, were speared by the Saami (Solberg 1932: 23).

Ringed seal also form a higher percentage of the identified seal remains at Gressbakken 3, 4 and 5 than at any of the other investigated houses. Fletcher *et al.* (1994) have demonstrated that there was a period of colder winters around 3700±200 BP. This probably meant greater ice formation in Varangerfjord than at present. Harbour seals are generally found in ice-free waters (King 1983), while the movements of ringed seals are largely dictated by the presence of ice (McLaren 1962). Today, harbour seals are "very common" in the fjord (Odner 1992: 44), while ringed seals appear in large numbers only during years with greater than normal amounts of ice (Øynes 1964). The high percentages of ringed seal relative to harbour seal in all of the late YSA assemblages supports the idea of greater ice formation at that time than during recent years.

Meskfjord, the shallow northern arm of inner Varangerfjord currently freezes annually (Helland 1906: 420). The southern arm, Karlebotn (*Stuorravuodna* in Saami), which is deeper and more open, freezes only occasionally (Simonsen 1961: 20). Four thousand years ago, the slightly colder winter temperatures and the shallower waters around Gressbakken would have encouraged the formation of ice around the site. The more convoluted coastline on the south side of the fjord would also have been more conducive to ice formation than the straighter, more exposed coasts on the north side of the fjord and in Karlebotn. The area immediately around Gressbakken must have had some of the thickest ice formation in the inner fjord, second only to that in Meskfjord. Female ringed seals prefer to locate their birthing lairs in areas of thick land-fast ice, and the density of young pups can be directly correlated with the quality of ice cover (King 1983; McLaren 1962). Thus, one would expect a particularly large number of ringed seal pups around Gressbakken as compared to other inner-fjord sites such as Bergeby and Karlebotn.

The distances between these sites are not large, and all are easily within a days' return journey from each other on foot or by boat. Karlebotn lies roughly ten kilometres west of Gressbakken, Bergeby is only nine kilometres to its north across the fjord (Figure 8.2). Why did the occupants of other sites not come to hunt whales, dolphins and ringed seals near Gressbakken if the conditions there were more suitable? According to the economic defensibility model of Dyson-Hudson & Smith (1978), hunter-gatherers tend to be more territorial in areas with relatively dense, predictable resources. Thomas (1981) demonstrated this very effectively using ethnographic evidence from the Great Basin. Hunter-gatherer groups in the region displayed different levels of territorial behaviour according to the nature of the resources being exploited. In the well-watered Owens Valley, the Paiute had access to relatively concentrated, predictable resources such as fish and piñon pine nuts which could be collected in large amounts and stored. They lived at relatively high population densities in permanent villages which controlled clearly-defined territories. The Shoshone of the arid Kawich mountain region lived in an area of sparse and dispersed resources. They were accordingly highly mobile, lived at low population densities and displayed little territoriality. The Reese River Shoshone lived in settled villages near predictable groves of piñon pine during the winter months. These groves produced pine nuts for only a two to three week period in the autumn, but the nuts were harvested in large quantities and stored. During the summer, the Reese River Shoshone split into smaller, more mobile groups in order to collect grass seeds, a more dispersed and less spatially predictable resource. While each winter village controlled access to specific piñon pine groves, they displayed little territoriality during the summer months.

Robert Kelly summarises the economic defensibility as follows; "territoriality becomes a more viable strategy as resource density increases because the size of the area to be defended, and hence the cost of defense, decreases relative to the benefit of the resources" (Kelly 1995: 192). An increase in competition for resources as a result of increased population density would also serve to increase the benefits of territoriality relative to the potential costs (ibid). Increased sedentism is almost inevitably associated with increased population density (Keeley 1988), and will therefore increase the probability of territorial behaviour. Thus, resource availability, sedentism, population density and territoriality all appear to be closely linked. All evidence suggests that the

first three factors were relatively high during the late Younger Stone Age in Varangerfjord. Migratory marine resources were available along the coast in large numbers at predictable times of year, with a particular concentration during the spring. The substantial house remains, large midden deposits and seasonal indicators among the faunal remains suggest extended period of occupation for the Gressbakken-type houses of the inner-fjord. The steady increase in the number and size of house depressions around the coast of Varangerfjord throughout the Younger Stone Age suggests that population density increased throughout the period, and was at its height during the Gressbakken phase (B. Olsen 1994).

However, the demonstration of relatively high levels of resource density and predictability at the coast, and of high levels of sedentism and population density does not in itself demonstrate territoriality. Some form of territoriality is suggested independently by the faunal evidence. The strong similarities between the three houses at Gressbakken Nedre Vest in terms of both the proportions of whale and dolphin remains among the identified mammals and the importance of ringed seal relative to harp seal suggest that they all had equal access to these resources. The smaller proportions of these species at Bergeby 18 and Karlebotn 1 suggest that these sites did not share the same access to whales, dolphins and ringed seals. The patterns observed reflect very localised differences in resource availability and suggest that the residents of Gressbakken had preferential or perhaps exclusive access to large marine mammal resources in the immediate vicinity of the site. Fairly circumscribed hunting territories are suggested for all of the sites.

This argument is further supported by the large amounts of reindeer at Karlebotn 1. Situated at the head of Varangerfjord, Karlebotnbakken is positioned directly on the main reindeer migration route in the region. Each spring and autumn, the reindeer pass through the corridor between the head of Varangerfjord and the Tana River, on their way between their winter habitat north of Lake Enare and their summer grazing areas on the Varanger peninsula. From Bergeby it is roughly fifteen kilometres over land to the head of the fjord, from Gressbakken approximately ten. The reindeer migration past the head of the fjord could easily have been exploited from Bergeby and Gressbakken, either directly, or through the use of logistical camps. Why, then, is there so little reindeer in the identified mammal bone from these sites as compared to Karlebotn? The occupants

of Karlebotn may have defended the territory between the head of the fjord and the Tana river, denying access to other communities in the region.

As the Great Basin example illustrates, territoriality during the late Younger Stone Age may not have extended to all resources or have been in effect at all times of year. Resources were particularly concentrated along the inner Varangerfjord coast in the spring. At this time, the waters of the fjord contained large numbers of cod and harp seals and large groups of white-nosed dolphins entered the fjord in pursuit of shoals of capelin. Ringed seal pups could be found on the ice. All of these resources could be obtained within a reasonably short distance from each site. Territorial boundaries may have been particularly strong at this time of year. Once this resource peak had passed, logistical forays away from the Gressbakken-settlements probably grew longer and territorial boundaries may have weakened as a result. Similarly, boundary defence may have relaxed if a residential move was made (for example to a salmon river). Territorial behaviour should also have been stronger with relation to resources which were more locally clustered than for those species which were more randomly distributed. This appears to be borne out by the faunal evidence. The evidence for territorial behaviour pertains to ringed seal pups and whales and dolphins (both stranded and hunted) which were more abundant or easier to capture on certain stretches of coastline than others. Territoriality is also suggested with respect to reindeer, which were heavily concentrated in certain parts of the interior during their migrations. Territorial behaviour was probably more limited or absent for less spatially predictable open water species such as harp seal and cod.

In most ethnographically documented cases territoriality, sedentism and relatively high population density are also accompanied by social hierarchies. In fact, the evidence for sedentism and high population density have been used to suggest that, by extension, there must have been permanent social hierarchies during the late Younger Stone Age (e.g. Myrvoll 1992; B. Olsen 1994; Renouf 1989; Schanche 1994). However, there is no independent evidence for such hierarchies in the mammalian faunal remains from the Gressbakken-type houses which have been excavated to date. Several explanations suggest themselves here. Such hierarchies may have existed and may simply not have manifested themselves in the distribution of faunal remains between houses. Alternatively, the middens may represent such a palimpsest, with the use of each house

by groups of different status, that any status differences reflected in the faunal record became blurred through time. However, this seems unlikely, given that differential deposition of seal cranial and post-cranial elements was clearly demonstrated on either side of the entrance passage at Gressbakken 5. A more interesting possibility is that late Younger Stone Age society was organised in a manner without direct parallels in the ethnographic record. These hunter-gatherers appear to have been relatively sedentary, and to have displayed territoriality with respect to certain resources, and yet to have maintained an egalitarian social organisation. "Ethnographic data can, if we let it, limit our ability to recognize unknown prehistoric forms of organization associated with hunting and gathering" (Kelly 1995: 339), and the rarity of defended territorial boundaries among modern egalitarian hunter-gatherers does not preclude their existence in the past.

8.3 Suggestions for further work

This investigation, like so many others in archaeology, has probably raised more questions than it has answered. Several new lines of inquiry are suggested. An egalitarian social organisation and a relatively high level of territoriality have been suggested by this analysis. Both propositions, however, require further testing through excavation of Gressbakken-type sites around the fjord. Three important goals should be:

1) To excavate a large open plan area including all house depressions on a given site. The inevitable financial constraints on research excavation mean that a smaller site would be preferable. The current lack of clear differentiation between faunal samples could be due to the fact that they are all from "low status" houses and a "high status" house remains to be excavated. Excavation of all house remains from a given site would test this possibility.

2) To select a site with very good local conditions for prey species with respect to which territorial behaviour has been suggested. Meskfjord is a good example of such a location, since it is at the head of the fjord directly on the reindeer migration route and is shallow enough to provide good ice conditions for ringed seal. If territorial behaviour existed in the inner-fjord, a site on Meskfjord should have relatively large percentages of ringed seal and reindeer compared to other sites.

3) To obtain a stratified series of radiocarbon dates from the middens associated with newly excavated Gressbakken-type houses. This would permit a better understanding of the exact nature of midden formation, and would provide much needed information about the duration of their use and the level of mixing in the deposits. At present, there are very few radiocarbon dates, if any, available for each midden.

Further work is also required in the south-Varanger region to understand the nature of settlement there and determine how it relates to that in the inner-fjord. An intensive survey of the hinterland would also be useful in this respect. It could reveal both residential camps and special purpose camps for salmon fishing, reindeer hunting etc, which might have been utilised by the occupants of either south-Varanger or the inner fjord.

Some of the methods developed and employed in this analysis could also benefit from further research. A reference collection of juvenile and adult ringed seals which all died at the same time of year would allow the "calibration" of seasonal determinations based on humerus and femur shaft width measurements. Measurements taken on the reference skeletons would demonstrate the size range of pups versus juveniles at a given time of year, and allow comparisons to an archaeological collection. It would also demonstrate the range of measurement found in adult ringed seals, permitting a discussion of the relative size of adults in an archaeological collection. The phocid seal identification manual could be made more complete based on observations of a wider range of juvenile bearded seal and hooded seal skeletons with all epiphyses still unfused.

In a much broader context, the approach taken in this analysis may also prove useful in other regions. The scale of the analysis was deliberately focused in both time and space and involved a comparison of the exploitation of a limited range of large mammals between and within a series of discrete domestic units. Faunal remains cannot always be attributed to individual households among archaeological hunter-gatherers, particularly where mobility is high and both dwellings and refuse deposits are ephemeral. However, among more sedentary hunter-gatherers, clearly defined house remains and middens are more common. Archaeological examples include both the Thule and Dorset cultures of Arctic North America. The approach taken here could fruitfully be applied in such

situations to allow a discussion of the social process governing access to specific resources and their distribution. In the Norwegian example presented here, the faunal evidence not only suggested an unforeseen level of both social equality and territoriality, but provided unexpected insight into symbolic behaviours associated with the seal skull.